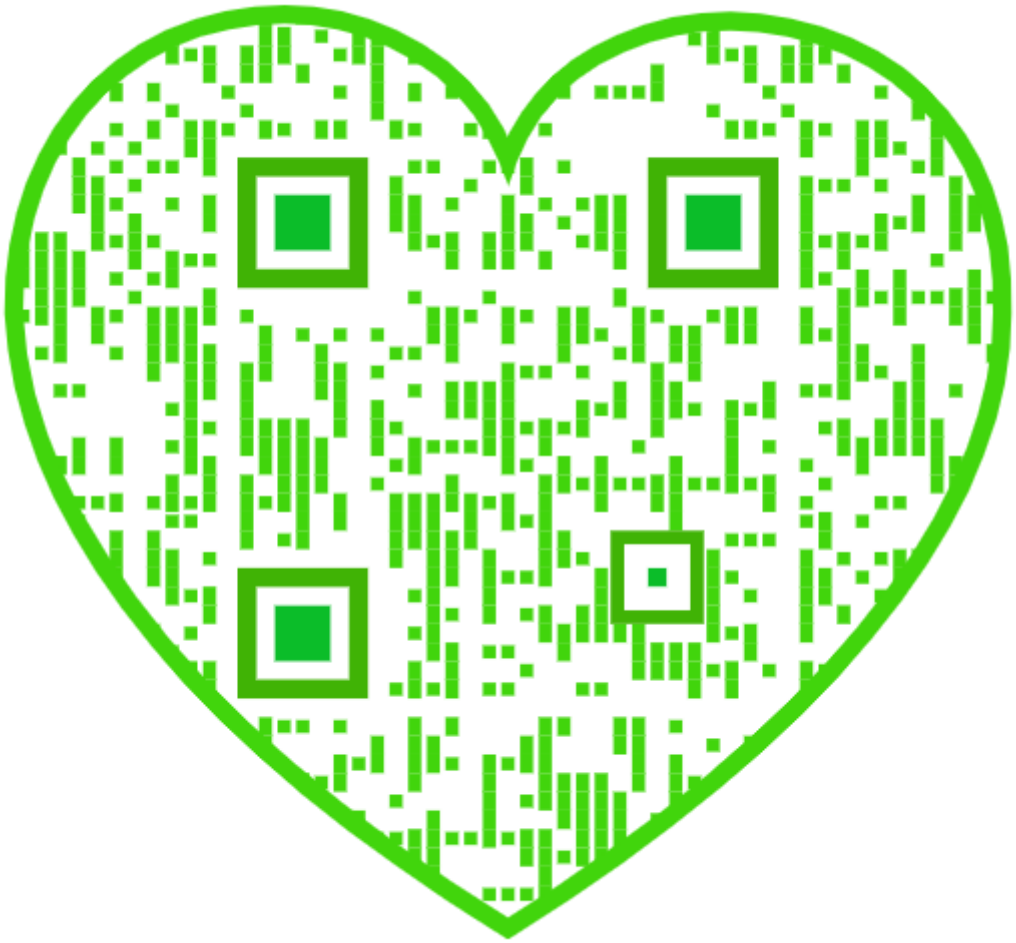

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BY

JOHN W. HARRISON, M.R.SAN.I.

MEM. INCOR. ASSOC. MUN. AND COUNTY ENGINEERS, SURVEYOR WOMBWELL, YORKS; LATE BUILDING SURVEYOR, BIRKENHEAD, AND LECTURER ON BUILDING CONSTRUCTION AT THE MUNICIPAL TECHNICAL SCHOOL, WIDNES; FORMERLY INSPECTOR OF NUISANCES, BRADFORD, AND TEACHER OF BUILDING CONSTRUCTION UNDER THE BRADFORD SCHOOL BOARD

WITH FIFTY-THREE ILLUSTRATIONS

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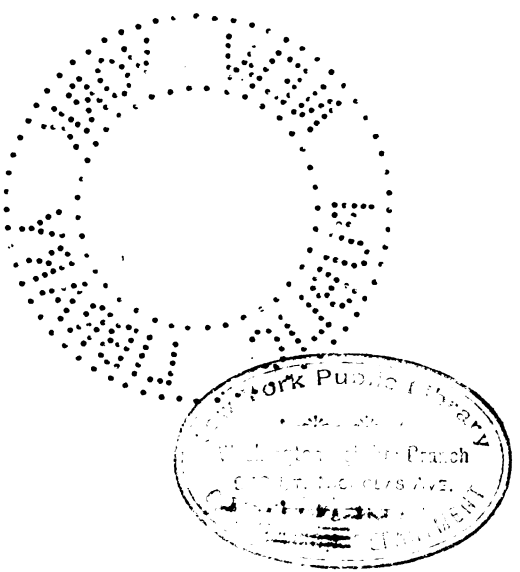

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PREFACE

THESE "Lessons on Sanitation" have been used by me with splendid success during the last seven years, and many of my successful students who now hold public appointments owe their success to them.

Since I first wrote them, more than seven years ago, they have been constantly altered, and additions made to keep them up to the latest knowledge and practice in sanitation.

I have found by experience that this method of teaching is the best, as a knowledge of any subject is learnt in an interesting manner, and, at the same time, as the student is learning the subject he is also learning how to put that knowledge down in writing, or to express his knowledge.

The lessons consist of four hundred questions and answers arranged in fifteen lessons. The first fourteen lessons consist of twenty-four questions and answers each, and the fifteenth lesson of sixty-four questions and answers for the viva-voce, or second day's examination, most of which have been asked of my students. The lessons are illustrated by fifty-three illustrations, and preceded by a List of Abbreviations used at the examination, and in practice. At the conclusion I have given, in an Appendix, a list of the places and societies holding examinations in sanitation, with names and addresses of the secretaries.

J. W. HARRISON.

May 1906.

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LIST OF ABBREVIATIONS USED AT THE ROYAL SANITARY INSTITUTE'S EXAMINATIONS

P.H.A. . .	Public Health Act, 1875
P.H.A.A. .	Public Health (Amendment) Act, 1890
P.H.L.A. .	Public Health (London) Act, 1891
P.H.W.A. .	Public Health (Water) Act, 1878
I.D.N.A. .	Infectious Diseases Notification Act, 1889
I.D.P.A. . .	Infectious Diseases Prevention Act, 1890
C.D.A.A. .	Contagious Diseases Animals Act, 1894, &c.
F. & D.A. .	Food and Drugs Acts, 1875, 1879, and 1899
F. & W. A. .	Factory and Workshops Acts, 1878 and 1901
C.B.A. . .	Canal Boats Acts, 1877 and 1884
H.W.C.A. .	Housing of the Working Classes Act, 1890
Q.F.A. . .	Quarry Fencing Act, 1887
M.A. . .	Margarine Act, 1887
S.H.R.A. . .	Sale of Horseflesh Regulation Act, 1889
R.P.P.A. . .	Rivers Pollution Prevention Acts, 1876 and 1893
M.O.H. . .	Medical Officer of Health
I.O.N. . .	Inspector of Nuisances
S.I. . . .	Sanitary Inspector
U.S.A. . .	Urban Sanitary Authority
R.S.A. . .	Rural Sanitary Authority
L.A. . .	Local Authority
S.A. . .	Sanitary Authority
L.G.B. . .	Local Government Board
D.C. & M.O. .	Dairy, Cowsheds and Milkshops Order, 1885–6
C.L.H. . .	Common Lodging-House
D.P. . .	Daily Penalty
< . . .	Not exceeding
> . . .	Not less than
V.I. . . .	Veterinary Inspector
W.C. . .	Water-Closet

= . . .	Equals
′ . .	Foot or feet when over a figure
″ . . .	Inch or inches when over a figure
× . . .	Multiply
+ . . .	Plus or addition
− . . .	Minus or subtract
÷ . . .	Divide or division
C.P. . .	Cattle Plague
D.I.D. . .	Dangerous Infectious Disease
B.L. . .	Bylaw or Bylaws
C.A. . .	Confirming Authority
P.S.A. . .	Port Sanitary Authority
O . . .	Owner
o . . .	Occupier
O.R. . . .	Official Representation
U.A. . .	Unhealthy Area
C.S.J. . .	Court of Summary Jurisdiction
U.H.H. . .	Unfit for Human Habitation
C.O. . .	Closing Order
D.O. . .	Demolition Order

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LESSONS ON SANITATION

LESSON I

WATER-SUPPLY

Q.—What are the characteristics of a good drinking-water?
A.—A good drinking-water should be clear, sparkling, and well aerated. It should contain no suspended matter which can be detected by the eye. It should be colourless, palatable, and have no particular odour.

Q.—What are the proper sources for drinking-water for towns and villages? Give also suspicious and dangerous sources.
A.—(*a*) According to the Rivers Pollution Commissioners, the following are the sources from which wholesome water is to be obtained:

(1) Spring water
(2) Deep well water } Wholesome.
(3) Upland surface water

(*b*) They also give the following:

Stored rain water
Surface water from cultivated lands } Suspicious.
River water to which sewage gains access
Shallow well water } Dangerous.

3 Q.—Is it a reliable test of the purity of a water to find that it is clear and sparkling?
A.—No; as water may be clear and sparkling and still be dangerously polluted by organic matter in solution.

4 Q.—Is animal or vegetable organic matter the most dangerous contaminating substance?
A.—Animal matter is the most dangerous.

5 Q.—What do we mean by hard and soft water? Whic the better for domestic purposes, and why?

A.—(*a*) Soft water is water with which it is easy to obta lather with soap. It contains little or no solid matte solution. When water contains a large quantity of lim solution, and will not readily form a lather with soap, i said to be hard. If the lime or other salts be presen above twelve degrees the water is said to be hard, below degrees, soft; and a degree of hardness means one grai lime or other salts per gallon of water. The hardness may be only temporary or permanent; the former is owing to bicarbonates of lime, &c., which may be removed by boili the latter is caused by the sulphates of lime, &c., wh cannot be got rid of by boiling.

(*b*) Soft water is much to be preferred for domestic poses, as by its use soap is saved and vegetables are be boiled in it; it also makes better tea. Hard water ca the substances boiled in it to be covered with a coatin bicarbonate of lime, &c., as also the vessel in which boiled.

6 Q.—What kind of wells are there? What are the chara of the waters yielded by them?

A.—(*a*) Wells may be divided into three classes, viz.:

(1) Surface wells.
(2) Deep wells.
(3) Artesian wells.

(*b*) Surface wells are confined to the soil which cont the ground or subsoil water. They may become polluted organic matter soaking through the soil into them, although the water may be freed from suspended matter filtering through the soil, and appear clear to the eye, dissolved impurities still remain. Pollution may also oc through the rising of the ground water, by which it reac a cesspool or other source of contamination. Surface w do not usually exceed 20 or 30 feet deep. Deep w are those which are sunk through an impervious strat into a deeper water-bearing one. The water may be h and not well aerated, but is generally free from orga matter. Deep wells may be from 100 to 300 feet d Artesian wells, so called from their occurrence in Artoi province in France, are those in which the water in find its own level rises up the well, and may even flow ove the mouth. The name is often applied to ordinary d

wells, and the water is similar but frequently warmer, as these wells are sometimes over 2000 feet deep.

Q.—How should a deep well be constructed in order to prevent contamination by subsoil drainage? What kind of cement should be used?

A.—(*a*) The sides or walls of the well should be constructed of good, hard-burnt bricks, built in cement down to the water level, or to the impervious stratum. Also a layer of puddled clay should be placed all round the outside, nine inches thick, between the brickwork and the soil. The top should be covered with stone slabs set in cement, and raised above the surrounding ground, by a stone curb to prevent surface pollution. The surface of the ground should, if possible, slope away from the well. It should be provided with a pump.

(*b*) The best Portland cement should be used.

8 Q.—What is the average annual rainfall in Great Britain? Also state how many gallons of water daily are necessary for all purposes?

A.—(*a*) The average annual rainfall in Great Britain is thirty inches, varying from twenty inches on the east coast to as much as seventy or more on the west coast of Scotland and Ireland.

(*b*) This varies with the habits of the people, their manufactures, &c., but Dr. Parkes gives twelve gallons per head for purely domestic purposes, and excluding a water-closet supply; to this should be added five or six gallons per day (per head) for water-closets, where they are in general use, five gallons per head for manufacturing purposes, and five ditto for municipal purposes, such as street watering, sewer flushing, &c. Glasgow allows fifty gallons per head and Sheffield only twenty; it cannot therefore be stated definitely, but twenty-five gallons per head per day is an average allowance for all purposes.

9 Q.—What are the dangers of storing water in house cisterns, and how may they be obviated?

A.—(*a*) The cistern is often placed in some inaccessible part of the house, where it becomes dirty from want of cleansing, also uncovered and unventilated, so that dust and dead

bodies of insects, vermin, as mice, beetles, &c., may gain acce
Also the w.c. is often supplied direct from this cistern,
that foul gases may thus gain access to the water. Or t
overflow pipe from the cistern may be connected direct
the soil-pipe or drain.

(*b*) To obviate these dangers the cistern should
placed in a room which is light, well ventilated, and ea
of access. The cistern should be covered, and clean
regularly about once a month. It should be constructed
a material which will not injuriously affect the water, a
should not be exposed to the sun's rays. A separate cister
to flush the w.c.s should be fixed and supplied from thi
storage cistern, termed a water-waste-preventer, as the
only flush two or three gallons per time. The overflow pip
should be taken through the external wall and be cut of
short so as to act as a warning pipe.

10 Q.—Why should one cistern not suffice for both the water
supply for drinking purposes and that required for the water
closet? Also state why the overflow of the cistern should
not communicate with the drain.

A.—(*a*) For two reasons. First, because the water would
become polluted by the foul air from the w.c. ascending the
flush pipes; second, a great waste of water is caused when
the w.c. is flushed unless a water-waste-preventing cistern is
fixed for w.c.

(*b*) The overflow from the cistern should not communicate
with the drain for the same reason as the flush pipe—viz.
the water would absorb the foul air or gases.

11 Q.—Which is the better system of water-supply, the
"constant" or the "intermittent"?

A.—The constant, as houses are supplied direct from the
mains, and the storage cistern, with its attendant danger
from pollution, want of cleansing, &c., is not necessary, except
for the hot water-supply. In the intermittent system, in
addition to the dangers attendant upon the use of a storage
cistern, when the water is turned off, a vacuum is caused
in the pipes, and any defect in the pipes allows filth from
any leaking drain or gas from gas mains, &c., to get into the
pipes.

Q.—Of what materials are the "main" and "house service" pipes for conveying water usually made?

A.—The main pipes are made of cast iron with a coating of some protective material to prevent rusting, as Dr. Angus Smith's solution or varnish. House service pipes are usually made of lead.

3 Q.—Is it more dangerous to convey "soft" water through lead service pipes than "hard" water? Name any materials suggested as a protective coating for pipes.

A.—(*a*) Yes, as the soft water dissolves the lead, while hard water deposits a protective coating or deposit on the inside of the pipes.

(*b*) Dr. Angus Smith's varnish; iron pipes coated with a particular oxide by the action of superheated steam for several hours in a chamber (termed the Bower-Barff process); lead pipes lined with tin; glass-lined iron pipes and galvanised iron pipes.

14 Q.—What are the characteristics of rain-water? Would you consider water containing $\frac{1}{10}$ of a grain of lead per gallon as unfit for drinking purposes?

A.—(*a*) The characteristics of rain-water are:

(1) Freedom from hardness, as, being a naturally distilled water, it cannot contain any appreciable quantity of lime or other salts.

(2) Thorough aeration. In its passage through the air it dissolves a certain amount of nitrogen and oxygen, and a small quantity of carbonic acid gas.

(3) Liability to take up any impurities from the air through which it passes, as sulphuric acid gas, &c. It is also often found to contain dust, soot, vegetable matter, excreta of birds, &c., which it washes down.

(*b*) Yes, decidedly unfit and poisonous; probably $\frac{1}{20}$ of a grain should be regarded as poisonous to most people.

15 Q.—Give the composition of an ordinary filter-bed.

A.—Filter-beds are composed partly of sand, which ought to be sharp, angular, and not too fine; and partly of gravel of varying degrees of coarseness. The outlet pipes are at the bottom and upon them is placed a layer of small stones, then gravel of decreasing coarseness, and on the top sand, which should be from $1\frac{1}{2}$ to 2 feet deep. Each square foot of

such a filter will allow seventy to seventy-five gallons to pass through it in twenty-four hours.

16 Q.—Enumerate the essential points of a good filter for domestic use.

A.—(1) A perfect filter must not contain any material which can impart injurious qualities to the water which passes through it.

(2) It must remove the organic impurities held in solution as well as the mechanically suspended matter.

(3) It must be so constructed that the user can take it to pieces himself, and thoroughly clean it with very little trouble and at very little cost.

17 Q.—How may the water of streams and rivers become polluted? In what way can such waters be purified?

A.—(*a*) The sources of pollution of rivers and streams are:

(1) Mineral impurities, such as carbonates and sulphates of lime and magnesia, from the bed of the stream and rocks over or through which the water has flowed.

(2) Sewage matter and general refuse of houses, villages and towns.

(3) Acids, alkalies, and manufacturer's waste from factories.

(*b*) By boiling such polluted water most of the mineral impurities are deposited, and the sewage matter is rendered harmless; but the suspended matter is not eliminated, while the acids and alkalies may not be affected. By afterwards filtering the water through gravel, sand and animal charcoal, it is re-oxygenated and the suspended matters are removed.

18 Q.—Calculate the capacity in gallons of a rectangular tank 215 feet by 215 feet and 12 feet deep. Also the pressure in lbs. per square foot on the bottom, and the total internal pressure upon one side of the tank.

A.—(*a*) The cubic capacity of the tank is $215 \times 215 \times 12 = 554{,}700$ cubic feet. One cubic foot $= 6{\cdot}25$ gallons. Then $554{,}700 \times 6{\cdot}25 = 3{,}466{,}875$ gallons in tank.

(*b*) As the pressure upon the bottom is directly proportional to the head of the water, which in this case is 12 feet, the pressure upon one square foot on the bottom will be equal to the weight of a column of water whose base

is one square foot and height 12 feet; one square foot multiplied by 12 feet (head) × 62.5 (the weight of one cubic foot of water) = 750 lbs.

(*c*) The internal pressure upon one side will be equal to the weight of a column of the liquid whose base equals the area pressed and whose height equals the depth of the centre of gravity of the area pressed below the surface of the liquid. The area of one side = 215 × 12 = 2580 square feet. The side of the tank is a rectangle and its centre of gravity will therefore be at its geometrical centre, viz., 6 feet below the surface of the water, and as one cubic foot of water weighs 62·5 lbs., then the total internal pressure on one side of the tank equals, 2580 × 6 × 62·5 = 967,500 lbs.

19 Q.—Does the ground water level of different districts vary, and has it any direct bearing upon the health of any given locality?

A.—(*a*) Yes. It varies according to the depth of the impervious stratum below, on which this water rests.

(*b*) Yes. It has been proved that in districts where the ground or subsoil water is high, it makes the locality damp, and dampness is one of the conditions which favour consumption and chest diseases generally, as also malarial fever. It also fosters and causes the spread of diphtheria.

20 Q.—Find the theoretical quantity of rain water obtainable from a single house roof 40 feet long and 18 feet wide during six months, taking the average rainfall and assuming that one inch of rain per square foot equals half a gallon.

A.—$40 \times 18 = 720$ square feet; and $720 \times \frac{30}{2} \times \frac{1}{2} = 5400$ gallons.

21 Q.—How many inches must the water be lowered in a square tank with 12-feet sides to fill a 6-inch drain 20 feet long?

A.—The capacity of a 6-inch drain 20 feet long = $\cdot 5^2 \times \cdot 7854 \times 20 = 3 \cdot 927$ cubic feet. The area of the tank is $12' \times 12' = 144$ square feet, and to obtain in it a capacity equivalent to that of the drain would require a vertical depth of $\frac{3 \cdot 927}{144} = \cdot 0272$ feet = ·3264 of an inch (that is less than one-third of an inch in depth).

22 Q.—How may water be polluted within a dwelling?

A.—By using filters constructed of improper materials or by neglect in cleaning them often and thoroughly. By using dirty vessels, or leaving them exposed to dust, flies, foul gases, &c. Also in the intermittent system a storage cistern becomes a necessity with its attendant dangers, as given in answer No. 9, also by the pipes absorbing foul gases, &c., when the water is turned off (as given in answer No. 11). In both systems if the water is soft it may dissolve lead from the pipes, &c. (as given in answer No. 13).

23 Q.—What steps would you take if a well in a village was reported to be polluted?

A.—I should proceed as soon as possible to the spot, provided with a new clean "Winchester quart" (half a gallon) bottle having a glass stopper and a leather cover for same. Also some string and sealing-wax and a seal to secure the stopper after taking the sample. I should rinse out the bottle two or three times in the water before taking the sample, and take care not to take the top water as it may be covered with dust or scum. After taking the sample I should make notes of the date, position of the well, reason or reasons for taking the sample, depth or approximate depth of well, distance from any possible source of pollution, as cesspool, privy, manure heap, drain, &c. I should examine the well and note whether it was lined or steined with stone or brickwork and if provided with a pump of what material it was made; ascertain, if possible, if the water is known to have caused any illness, as if so this is the best evidence in an opposed case. After sealing I should take (if not too far) or send the same and particulars as quickly as possible to the public analyst, and on receiving the result of his analysis I should report to the sanitary authority, who may pass a resolution that proceedings be taken against the owner to close or amend the well.

24 Q.—Describe and sketch the Pasteur-Chamberland Filter.

A.—(*a*) The filtering medium is a specially prepared, fine-grained, unglazed porcelain cylinder, which is open at the lower end only, where it is provided with a glazed porcelain nozzle. The cylinder is enclosed in a case through the bottom end of which the nozzle passes, and communicating with the

top end there is a pipe with a screw socket for fastening the filter to a water tap. The water enters the outer case and filters through the cylinder into its internal cavity and escapes through the nozzle at its lower end.

(*b*)

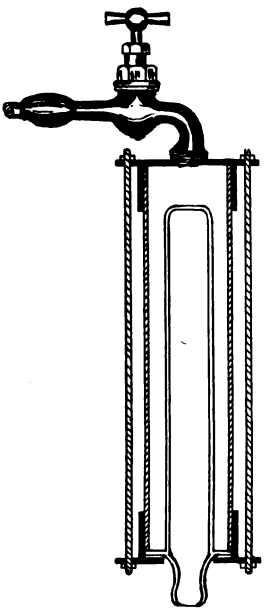


FIG. 1.

LESSON II

VENTILATION AND CUBIC SPACE, ETC.

1 Q.—Give roughly the composition of the atmosphere, and briefly state the properties of the chief gases present.

A.—(*a*) The composition of the atmosphere varies in different situations. In the following table the proportions of the various ingredients of an average sample are given:

Oxygen, 209·6 per 1000 volumes.
Nitrogen (including Argon, &c.), 790·0 per 1000 volumes.
Carbon-dioxide, 0·3 per 1000 volumes.
Watery vapour, varies with temperature.
Ammonia, a trace.
Organic matter, variable.
Ozone, variable.
Salts of Sodium, variable.
Other mineral impurities, variable.

(*b*) Oxygen is the all important element. It is the gas to which the air owes its purifying power, and it is the great supporter of combustion. If the proportion present were much diminished a light would cease to burn, and life would become impossible. Nitrogen acts as a diluent of oxygen, which in its pure state is far too potent. Unlike oxygen, it does not support combustion, but, like carbon-dioxide, if present in excess it extinguishes a light. The quantity of carbon-dioxide present varies from ·3 to ·5 part per 1000 of out-door air; the former may be the proportion in mountainous districts, and the latter in some densely populated parts of towns.

2 Q.—What makes an over-crowded room unhealthy?

A.—In addition to carbon-dioxide, a large quantity of organic matter (the result of tissue waste), and also impure watery vapour are given off from the lungs and skin, and it is to

these that injury must be, in a large measure, attributed. Carbon-dioxide may be present in considerable quantity without any ill effects being apparent, as is proved in the case of workers in aerated water manufactories. It has been proved that the ratio of carbon-dioxide added to the air as the result of respiration, corresponds very closely with the amount of organic matter from the same source, and for this reason it is taken as a standard of purity. It is the presence of effete organic matter from our bodies that causes the disagreeable odour and sensation of stuffiness experienced in occupied rooms that are not ventilated.

3 Q.—What is the relative importance of the changes produced in air by respiration? And how many cubic feet of air per hour should an adult have?

A.—(*a*) The changes produced in air by respiration are:

(1) The quantity of oxygen is diminished.
(2) The quantity of carbon-dioxide is increased.
(3) The quantity of watery vapour is increased.
(4) The expired air contains a certain quantity of foul organic matter from the lungs.
(5) The air is heated.

Of these five changes the most important are the first and fourth. It is the diminution of oxygen and the presence of organic matter in the air which makes it unfit to breathe again.

(*b*) 3000 cubic feet.

4 Q.—What cubic space per head is usually allowed in schools, common lodging-houses, cottages, and barracks? and is the allowance sufficient?

A.—(*a*) In schools 80 or 100 cubic feet; in common lodging-houses 300 cubic feet; in cottages there is no legal limit, but the same amount is usually taken as allowed in common lodging-houses; in barracks 600 cubic feet.

(*b*) No, it is not sufficient.

5 Q.—Can a larger space be substituted for a continued supply of fresh air?

A.—No; as even with a space of 10,000 cubic feet occupied by only one person, in the absence of ventilation the limit of impurity would be reached in a little over three hours, after which time the same amount of fresh air would have to be

introduced as in the case of smaller rooms, in order not to exceed the standard of impurity.

6 Q.—What impurities in air are caused by various manufacturing processes?

A.—(*a*) Hydrochloric acid gas from alkali works.

(*b*) Sulphurous and sulphuric acids, from copper works, and from manufactories where bleaching is carried on.

(*c*) Sulphuretted hydrogen and ammonia, from most chemical works and gasworks.

(*d*) Carbon-dioxide, carbon-monoxide, and sulphuretted hydrogen, from brick-kilns and cement works.

(*e*) Carbon-monoxide is given off in large quantities from the furnaces of smelting iron and copper works.

(*f*) Organic matter from glue-makers, bone-burners, slaughter-houses, &c.

(*g*) Oxide of zinc from brass trades.

(*h*) Arsenic fumes, from copper-smelting works.

(*i*) Carbon bisulphide, from india-rubber works.

Besides the above, almost all manufacturing processes consume —and very imperfectly—large quantities of coal, &c., and give off immense quantities of carbon in the form of soot from the chimneys, and thus pollute the air.

7 Q.—What are the natural forces of ventilation, and why is the incoming air greater in winter than in summer?

A.—(*a*) The chief forces acting in nature which encourage ventilation are:

(1) Diffusion;

(2) The action of the winds;

(3) The movement produced by unequal weights of air upon which principle the wind itself is dependent.

(*b*) When the temperature of our rooms is raised it is warmer than the external air, consequently the air expands, and by reason of its increase in volume the room cannot contain the same quantity as before; a portion, therefore, is discharged through any opening that may exist, and if the outside air is not raised in temperature also, an inequality is at once established between the one and the other, and the cold air outside being heavier than the warm air inside, by the law of gravitation it will enter the room by various openings, and will continue to do so until such time as the temperature of the one is equal to that of the other, the warmer the air inside the room is relatively to that outside, the more rapid is the inflow.

8 Q.—What is the best position in a room for inlet and outlet ventilators? How large an inlet-opening is required for each person, and why? And should the areas of inlet and outlet ventilators be the same, and why?

A.—(*a*) The inlets should be placed in situations as far as possible removed from the outlets, so as to ensure as complete a circulation of air as possible. If they are placed close together the air will enter and pass out without mixing with that of the room, and so the object for which they are intended, namely, the dilution of the impure atmosphere, will not be accomplished. The warm air being lighter than cold has a tendency to rise, therefore the most suitable position for outlets is in or near the ceiling; for the same reason, namely, that cold air is heavier than warm, the inlets should be placed above people's heads so that the cold air is warmed in falling, and thus draughts are avoided. About 6 feet above the floor is a suitable height.

(*b*) The inlet opening for each individual should not be less than 24 square inches. If the air moves at the rate of 5 feet per second, such an inlet would supply 3000 cubic feet of air per hour. As 3000 cubic feet per hour is required per head this would be right.

(*c*) Theoretically, the size of the outlet should be larger than that of the inlet, because warm air has a greater volume than cold air, but the difference is so slight that it may be disregarded and both openings made the same size.

9 Q.—Does friction in an inlet tube greatly affect the velocity and volume of the air entering?

Enumerate the chief causes of friction.

A.—(*a*) Yes.

(*b*) The chief causes of friction are bends, angles, roughness of surface, and length of tubes.

10 Q.—Describe McKinnell's, Hinckes Bird's, and Boyle's (Mica-flap) ventilators. State the particular advantages of each?

A.—McKinnell's ventilator is a combined inlet and outlet ventilator which is only suitable for upper rooms or one-storey buildings. It consists of two tubes—the one encircling the other. The area of both is the same, but the inner one, which acts as the outlet, is continued for some distance above the other, and is fitted with a cowl or cover to keep out the rain, &c. The lower end of the inner tube is prolonged a little distance into the room, and has a flanged

rim some inches in width which extends beyond the area covered by the outer tube, and thus prevents the incoming air from descending at once into the room, and causes it to spread out to the sides for some distance parallel to the ceiling.

Hinckes Bird's ventilator consists of a piece of wood or plate glass two or three inches deep or wide and the length of the window sash. It is fixed under the lower sash which is raised for this purpose, so causing an opening between the meeting-rails of the upper and lower sashes, thus allowing air to enter the room and directing it upwards also. But a better plan (and less unsightly) is to make the bottom inside beading on the sash frame about three inches high, the lower sash to be lifted nearly that height, when the same object is attained.

Boyle's Mica-flap ventilator is an outlet vent, designed to be fixed in the chimney flue or a special flue made on purpose close to the ceiling of the room. Back draught is prevented by means of valves, which are thin talc plates suspended on cross-bars behind the grating, these move backwards when the draught is from the room, and close tight to the frame when any down draught occurs from the chimney. The noise made by the talc valves can be remedied by having the valves made of silk, which is often done in the newer designs. In time the valves become clogged with soot when fixed in smoke flues; this is why they are better fixed in separate air flues.

11 Q. Sketch the Sheringham Valve and Tobin's Tube Ventilators.

A.—*See* Figures 2 and 3.

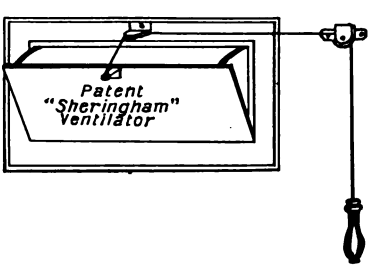


FIG. 2.

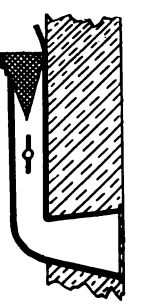


FIG. 3.

12 Q.—How may a room be lighted with gas so as to assist in the general ventilation of the apartment? and how many cubic feet of air will an ordinary gas burner consume per hour?

A.—(*a*) What are known as sun-burners are fixed near the ceiling and connected with an outlet shaft. The heat generated by the gas is thus taken advantage of as an extracting power, and all noxious fumes, the result of combustion, are at once carried away, together with a large amount of foul air from the room.

(*b*) An ordinary gas burner will consume from three to five cubic feet of gas per hour, and will therefore require a supply of from 5000 to 9000 cubic feet of air per hour, or as much as two or three adults.

13 Q.—Why is a properly constructed open fireplace preferable to a stove for warming and ventilating a room? Explain what is meant by the terms "Radiation" and "Convection."

A.—(*a*) The fireplace (when a fire is lit) and the chimney combine to act as a powerful extractor of air from the room, so that the air in the room is being continually changed, while in the case of warming by a stove no such action takes place, or only to a limited degree, and when the stove door is open; a stove also dries up the air in a room, as also do hot-water pipes.

(*b*) Radiation is the propagation of heat from a hot body in all directions with equal intensity, the effect lessening according to the square of the distance; thus, if the heat at one foot distance from a fire be taken as 1, then at 10 feet it will be 100 times less. Convection is that mode in which the heat is propagated by moving masses of air, which is dependent upon the characteristic of allowing the portion which has been heated to expand and rise, and colder air to take its place setting up a sort of circulation until the whole mass is warmed. The open fireplace is an example of radiation; stoves and hot water pipes are examples of convection.

14 Q.—Define overcrowding. Calculate the cubic capacity of a room, 11 feet high, by 40 feet long, by 30 wide, and having a semi-circular bow window 20 feet wide.

A.—(*a*) Theoretically, overcrowding is when there is not 1000 cubic feet of air space per adult person, but, legally, when there is less than 300 cubic feet (as allowed for common lodging-houses) the room is badly overcrowded.

(*b*) The floor area of the room = the rectangular part added to the area of the semi-circular bow window, thus: 40 × 30 = 1200 square feet in rectangle, and $20 \times 20 \times \cdot 7854 \div \frac{1}{2} = 157 \cdot 08$ square feet in bow-window. Add these results together, then $1200 + 157 \cdot 08 = 1357 \cdot 08$ square feet of floor area; multiply this by the height of the room and the result will be the cubic contents in feet thus: $1357 \cdot 08 \times 11 = 14{,}927 \cdot 88$.

15 Q.—A room contains 960 cubic feet of space. It is 12 feet long and 8 feet high. What is its breadth?

A.—$12 \times 8 = 96$, and $960 \div 96 = 10$ feet; then the room is 10 feet broad, or wide.

16 Q.—Find the cubic contents of a sleeping-room which is 40 feet long, 10 feet wide, and of which the sketch here given is a section, allowing 12 feet of height as available air space. Also, state how many adults it would accommodate.

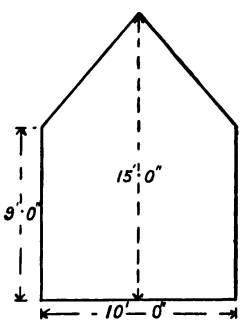


FIG. 4.

A.—(*a*)

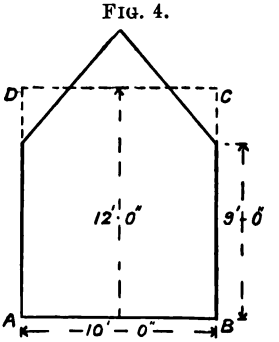


FIG. 5.

From the area of the rectangle ABCD (*see* Fig. 5), 12 feet by 10 feet = 120 square feet, deduct the triangular corner-pieces, which together equal a rectangle of 3 feet by $2\frac{1}{2}$ feet = $7\frac{1}{2}$ square feet, then $120 - 7\frac{1}{2} = 112\frac{1}{2}$ square feet = the available area of the cross-section, which multiplied by 40 feet long = 4500 cubic feet in room.

(*b*) Allowing each person 900 cubic feet it would accommodate five adults; allowing each person 500 cubic feet it would accommodate nine adults; allowing each person 300 cubic feet it would accommodate fifteen adults.

17 Q.—A room is 20 feet long, 15 feet wide, 12 feet high at one side, and 9 feet high at the opposite side. What is its cubic capacity?

A.—$\frac{12+9}{2} = \frac{21}{2} = 10\frac{1}{2}$ feet, mean or average height; then $10\frac{1}{2} \times 15 \times 20 = 3150$ cubic feet.

18 Q.—Calculate the cubic contents of a room, as shown in Fig. 6, one side being the segment of a circle, and the height being 12 feet.

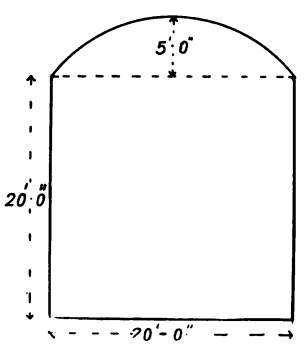


FIG. 6.

A.—The area of the segment of a circle may be calculated by the following formula; where Ch means Chord and H means Height; then

$$\text{Area} = (\text{Ch} \times \text{H} \times \frac{2}{3}) + \frac{\text{H}^3}{2\text{Ch}}$$

In this case it is worked out thus:

$(20 \times 5 \times \frac{2}{3}) + \frac{125}{40} = \frac{200}{3} + \frac{25}{8} = \frac{1675}{24} = 69{\cdot}8$ square feet, area of floor of segment.

Area of the rectangular part = $20 \times 20 = 400$ square feet. Total floor area = $400 + 69{\cdot}8 = 469{\cdot}8$; and $469{\cdot}8 \times 12 = 5637{\cdot}6$, cubic feet in room.

19 Q.—How many gallons of water may be contained in a pipe drain, 6 inches in diameter and 30 feet long, and in a vertical soil-pipe, 4 inches in diameter and 20 feet long or high?

A.—As one cubic foot of water = 6·25 gallons, therefore the quantity in the pipe drain equals $\cdot 5^2 \times \cdot 7854 \times 30 \times 6{\cdot}25 = 36{\cdot}8$ gallons, and the quantity in the soil-pipe = $\cdot 3333^2 \times \cdot 7854 \times 20 \times 6{\cdot}25 = 10{\cdot}9$ gallons. Total gallons in drain and soil-pipe = 47·7.

Or, a ready way of finding the number of gallons in a circular pipe is to square the diameter of the pipe in inches and multiply the result by ·034, which gives the number of gallons in one foot length of pipe, then multiply by the length of the pipe in feet for number of gallons in drain or pipe. Applied to the foregoing it gives for the drain $6^2 \times \cdot 034 \times 30 = 36{\cdot}7$ gallons, and for the soil-pipe $4^2 \times \cdot 034 \times 20 = 10{\cdot}88$ gallons. Total = 47·58 gallons.

20 Q.—What is the cubic capacity of a room which is 12 feet high and has a floor of the shape and dimensions shown in Fig. 7?

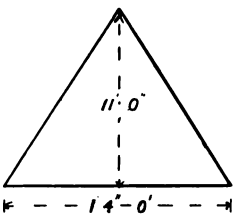


FIG. 7.

A.—$14 \times 5\frac{1}{2} = 77$ square feet floor area, and $77 \times 12 = 924$ cubic feet.

21 Q.—By what method can the direction and velocity of the air current be ascertained?

A.—The direction can be ascertained by burning small pieces of velvet, &c., and noting the direction taken by the smoke, or by floating small hydrogen balloons. The velocity can be ascertained by means of an anemometer.

22 Q.—What is the cubic capacity of a room which is 10 feet high, and of which the floor and ceiling are of the shape shown in Fig. 8, assuming AB to be 6 feet, BC to be 8 feet, CD to be 6 feet, BD to be 10 feet, BF to be 5 feet, DF to be 9 feet, AF to be 4 feet, GH to be 3 feet, and CE to be 4 feet?

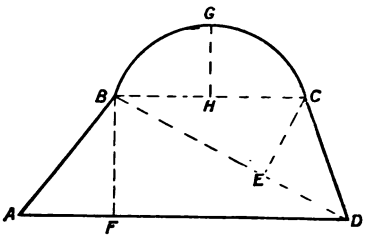


FIG. 8.

A.—ABF . $4 \times \frac{5}{2} \times 10 = 100$ cubic feet

FBD . $9 \times \frac{5}{2} \times 10 = 225$ „

BEC . $7 \times \frac{4}{2} \times 10 = 140$ „

CED . $3 \times \frac{4}{2} \times 10 = 60$ „

BGC . $(\frac{2}{3} \times 8 \times 3) + \frac{27}{2 \times 8} \times 10 = 16 + \frac{27}{16} \times 10 =$ 177 cubic feet (approx.).

This gives a total cubic capacity of 702 feet (approx.).

23 Q.—How would you proceed to take a sample of air from a room for the purpose of analysis?

A.—I would procure a glass jar or bottle provided, if possible, with an india-rubber cap or stopper, and capable of holding from half to one gallon. Fill the bottle with clean water and, after emptying the water out in the room or air-space it is desired to take sample from, carefully dry the bottle inside and close air-tight by means of india-rubber cap or stopper, seal it and take it to the analyst with all speed, accompanied by all necessary particulars. The bottle fills with the air of the room as quickly as the water escapes from it. The bottle should be a wide-mouthed one, so that the hand can be put in to wipe it dry inside. Instead of water, cotton down or a handkerchief may be tightly stuffed in.

24 Q.—What are the cubic contents of a room 9 feet high, and of the shape and dimensions shown in sketch (Fig. 9)? And what is the greatest number of adults you would allow to sleep in such a room? Show by a sketch the arrangement of the beds.

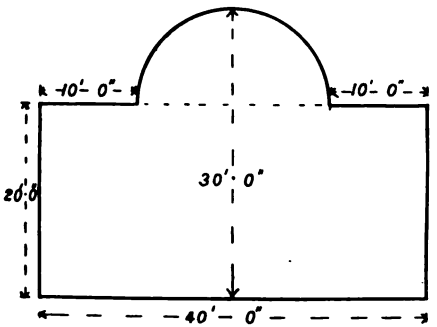


FIG. 9.

A.—(*a*) Rectangle = $40 \times 20 = 800$ square feet. Semi-circle = $20 \times 20 \times \cdot 7854 \times \frac{1}{2} = 157$ square feet approximately.

Add area of rectangle to area of semi-circle thus:—$800 + 157 = 957$ square feet (area of room), and 957 multiplied by the height of room $= 957 \times 9 = 8613$ cubic feet.

(*b*) At 300 cubic feet each, the room would accommodate 28 adults, the 213 cubic feet over would be taken up by the beds, the bodies of the occupiers, &c. But as this would only allow 34 square feet of floor space for each adult, and 40 is the least that should be allowed, then $957 \div 40 = 23$ adults and 37 square feet over, or say 24 adults at the most.

(*c*)

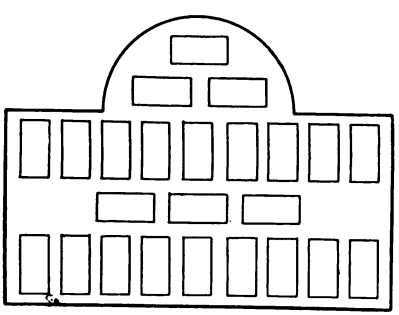


FIG. 10.

LESSON III

DRAINAGE, SANITARY APPLIANCES, ETC.

1 Q.—What is the difference between a "drain" and a "sewer"? and, are authorities agreed that a trap should be placed between a house drain and a sewer?

A.—(*a*) By section 4 of the Public Health Act, 1875, a "Drain" means any drain of and used for the drainage of one building only, and made merely for the purpose of communicating therefrom with a cesspool or other like receptacle for drainage, or with a sewer into which the drainage of two or more buildings or premises occupied by different persons is conveyed. "Sewer" includes sewers and drains of every description except drains to which the word "drain" interpreted as aforesaid applies, and except drains vested in or under the control of any authority having the management of roads and not being a local authority under this Act.

(*b*) No. As some sanitary engineers now advocate the direct connection with sewers (without the intervention of a disconnecting or intercepting trap) of all house drains, in which case the soil-pipes and ventilating-shafts assist in the ventilation of the sewers, but it is only where the sewers are constructed on the most approved principles that such a plan should even be thought of; it would be a dangerous proceeding in the case of old and badly constructed sewers.

2 Q.—Of what materials should house drains and sewers be made? State how they should be laid. Give the minimum fall for house drains.

A.—(*a*) Glazed socketed stoneware pipes are alone admissible for drains and sewers up to eighteen inches diameter.

(*b*) They should be laid as far as possible in straight lines, with the socket end directed towards the upper end of the

drain or sewer. They should rest on a solid foundation and on the body of the pipes, not on the sockets.

(*c*) The fall should be such as to ensure a self-cleansing velocity in the sewage, that is, not less than 1 in 40 for a 4-inch pipe and 1 in 60 for a 6-inch pipe when flowing full or half full. The fall should be uniform throughout the drain.

3 Q.—Name a very common fault made in the size of drains, and state what you consider to be an average size for house drains.

A.—(*a*) Drains are very often needlessly large, and thus the flush is much reduced. For example; given two drains of equal fall, each carrying the same volume of sewage, one 4 inches and the other 6 inches in diameter, the rate of travel, and therefore the flushing-power will be greater in the small drain because the depth of liquid is greater than it is in the larger drain.

(*b*) As a rule 4 inches is large enough except in the case of large houses or hotels.

4 Q.—How should the joints of drain-pipes be made, and under what circumstances is a bedding of concrete necessary?

A.—(*a*) Joints should be made with the greatest care, the best Portland cement being alone admissible. Having carefully cemented the joint, not only at the top but all round, the workman, before making the next joint, should rake out the pipe with a specially constructed wooden implement to make sure that no cement is left inside the pipe, otherwise it will set and form an obstruction. A good plan is to lay a bedding of cement on the lower half of the pipe before inserting the spigot end of the next pipe, then, after pressing inwards and downwards the next pipe, we are sure of a good bedding in the lower half of the joint; also if the inverts of the two pipes are not quite level or straight the drop will be downwards in the direction of the flow of the sewage. The joint should then be made with cement, as before mentioned, and the cement inside the socket should meet that outside, thus forming a thoroughly watertight joint.

(*b*) Unless the ground is naturally solid all drains should be laid on a bed of concrete at least 4 inches thick, and if through, or under, a building or near a well, &c., the drain should be embedded all round in 6 inches of concrete, but, unless there is no other way, drains should not be laid under buildings or near wells.

5 Q.—What are the essential conditions to be observed in forming junctions and bends in drains?

A.—Junctions must always be in the form of a Y; no branch drain should join at right angles, nor in the contrary direction to the flow of the sewage; if they do so join the main drain, splashing will occur, and this in time leads to obstruction. Bends should as far as possible be avoided, and when unavoidable should be as easy as possible.

6 Q.—Specify the main points requiring attention in traps used in house drainage.

A.—They must be self-cleansing (except gullies) and this means that there shall be no angles, cavities or projections inside them. They must impose a sufficient and constant barrier, or seal, against the passage of sewer gas through them; this necessitates a depth of water seal of at least $1\frac{1}{2}$ inches. Means of access should be provided to all traps as they are a source of obstruction to drains. Also where liable to syphonage an air-pipe on the sewer side of trap must be provided. The air-pipe (or anti-syphonage pipe) should also be fixed where there is any danger of sewer gas forcing the seal, but this should not occur if the drains and sewers are properly ventilated.

7 Q.—Sketch good and bad forms of the intercepting, or syphon traps, and point out some defects.

A.—(*a*)

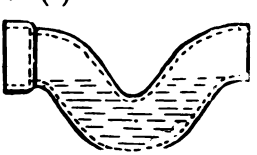


FIG. 11.

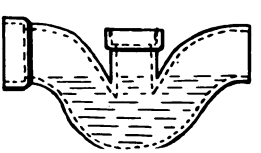


FIG. 12.

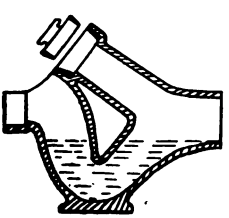


FIG. 13.

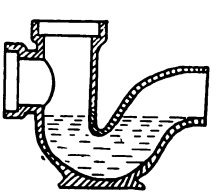


FIG. 14

(*b*) Fig. 11 is defective because the dip is not sufficient to form a proper water seal; the bottom of the trap is rounded underneath, consequently there is a risk of its being fixed out of level; there is no provision for the ventilation of the drain, and also there is no means of access to the trap or drain beyond in case of obstruction. Fig. 12 is open to the same objections as Fig. 11, except as to the access in case of obstruction; there is the additional objection that floating matters are likely to accumulate in the central opening or shaft. Fig. 13 is a good form of interceptor, suitable for a manhole or disconnecting chamber, and Fig. 14 is a similar trap for use where no chamber is provided.

8 Q.—Why are the "Bell," "Dipstone," "Antill's" and "D" considered objectionable forms of trap?

A.—In the Bell trap the seal is insufficient; it is likely to get choked by the settlement of mud, dust, &c. The cover and bell being loose are often lifted off when the drain or waste pipe is left untrapped. The Dipstone or Mason's trap is little better than a cesspool. It is not self-cleansing, solids collect at each end, and it is seldom water-tight or air-tight. Antill's trap, although an improvement on the Bell trap, is not satisfactory, as it is soon obstructed by deposit. In the D trap there are too many sharp angles, also in time the dip pipe becomes corroded away to above the water-line; thus the trap is rendered useless and sewer gas can pass freely through it.

9 Q.—Give sketches of "Gully," "Grease," "Anti-D" and "S" traps, and state the special purpose for which each is most suitable.

A.—(*a*)

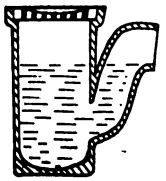


FIG. 15.

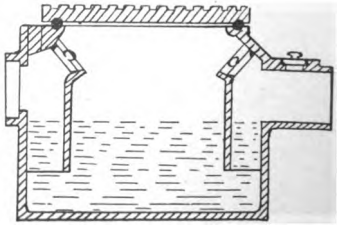


FIG. 16.

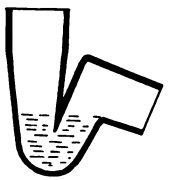


FIG. 17.

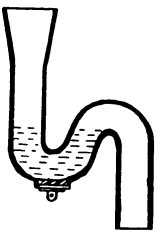


FIG. 18.

(*b*) The gully trap, Fig. 15, is used for yard drainage, also to disconnect waste-pipes from the drain or sewer, and for streets, &c. The grease trap, Fig. 16, is used instead of a gully to receive the waste water from the scullery sinks, &c., but it is only necessary for large hotels, mansions, &c. The anti-D trap, Fig. 17, is a modification of the S or P trap, the outlet of the trap is made square in section to guard against syphonage, and the part of the trap forming the seal is less in diameter than either the inlet or outlet of the trap. The S or P trap, Fig. 18, or some modification of it, is the only form of trap which should be allowed on waste pipes, and it should be fixed immediately under the sink, &c.

10 Q.—At what rate should sewage flow, and do large sewers require the same fall as small ones in order to get an equal velocity in the flow of the sewage?

A.—According to Mr. Baldwin Latham sewers of from 12 to 24 inches diameter should have a fall or gradient sufficient to produce a velocity of not less than 2 feet per second. A less gradient is required for large sewers than for small ones, but the volume of the sewage must be very much greater. The velocity of sewage in house drains should not be less than 3 feet per second.

11 Q.—Explain why manholes are introduced into a sewerage system, and state how they should be constructed.

A.—(*a*) Manholes are introduced in drainage and sewerage systems, for the purpose of access and inspection of the drains and sewers. They should be built at all important junctions and bends, and not more than 100 yards apart in

straight lengths of sewers. When manholes are provided, stopped drains and sewers can generally be cleared by means of drain rods, thus saving expense in opening out the ground and taking up the drain or sewer.

(*b*) They should be built of hard, well-burnt bricks in cement mortar, and the drain or sewer should be continued across the floor in open half-channel pipes laid on a bed of concrete, and the sides of the channel carried up several inches higher than the top of the drain or sewer, so as to prevent overflowing; the sides should also have a good slope inwards towards the channel. They should be covered with cast-iron air-tight covers, and be ventilated.

12 Q.—Give a sketch of an automatic flushing-tank, and explain the action and use of the same.

A.—(*a*)

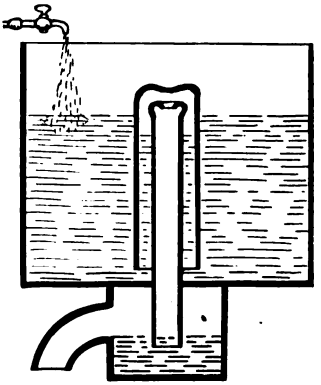


FIG. 19.

(*b*) In Field's and similar flushing-tanks, the automatic discharge is accomplished by means of a syphon. Passing through the floor of the tank is a pipe which is open at both ends, the bottom end is in a small chamber underneath containing water into which the pipe dips, this pipe is surrounded by a larger pipe or cap, only open at the bottom, which does not quite reach to the bottom of the tank. A tap is connected with the tank, and, as the water rises in the tank the air is displaced down the central pipe by compression,

because as the water ascends between the outer and inner pipes, the air, or some of it, is driven through the water in the lower chamber, and, when the water has risen to the top of the central pipe, it begins to fall down into the lower chamber carrying a certain quantity of air with it, and in time a sufficient vacuum is established within the pipe, to cause the pressure of the atmosphere to force the water from the tank into it, and thus syphonic action being started, the tank is rapidly emptied through the outlet at the lower end into the drain. The top rim of the central pipe is curved inwards so that the water falls freely down the centre instead of trickling down the sides. These tanks are used at the head of drains and sewers, where a sufficient fall cannot be obtained to render them self-cleansing. For large sewers they are generally built of brickwork. They are also used for flushing ranges of trough closets, &c.

13 Q.—Which is the best system of sewage removal, the "Water-Carriage" or the "Conservancy System?"

A.—Great difference of opinion has hitherto prevailed as to which ought to have the preference, but the water carriage system is now generally admitted to be the best, except in the case of scattered populations dependent for their water-supply upon local wells.

14 Q.—What are the main points requiring attention to prevent sewage and accumulations of house refuse becoming a nuisance? Explain the term "putrefaction."

A.—(*a*) The great principle to keep in mind is the thorough and immediate removal of all fluid refuse from the vicinity of dwellings, and the storage of all solid refuse in such a manner, and for such short periods, as not to cause a nuisance.

(*b*) Putrefaction is the result of an attack upon dead organic matter by minute living germs, or bacteria, ever present in the air.

15 Q.—Which method of disposing of dry refuse is considered the most efficient and safest in the interests of public health? Give a sketch of a Destructor.

A.—(*a*) Destruction by burning in properly constructed Refuse-Destructors.

(*b*)

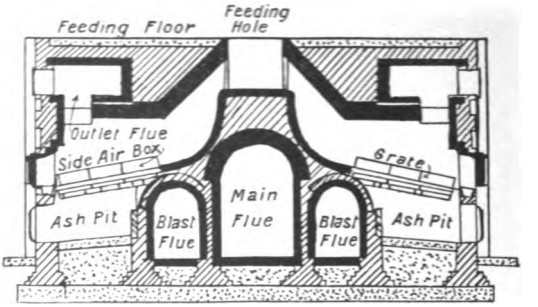


FIG. 20.—Horsfall Destructor.

16 Q.—Name the conditions necessary to be observed in the construction of a cesspool, also privies with movable receptacles.

A.—(*a*) They must be absolutely water-tight. This may be accomplished by building them with hard, well-burnt bricks in cement mortar, and placing round the sides and under it a layer of puddled clay 6 or 9 inches thick. Also rendering the inside with good cement mortar. The cesspool should be from 50 to 100 feet from a dwelling-house, and as far as possible from any well or other source of water-supply. It should be situated on the lowest place in the locality, so that the surface and subsoil water will flow towards it. An arched roof should be built with three openings, one for a ventilating shaft, one for a pump, and a larger one for gaining access to the cesspool for the purpose of cleansing, repairs, &c. This should be provided with an air-tight manhole cover.

(*b*) So far as the structure itself is concerned, this privy does not differ from the one with fixed receptacle. For a movable receptacle the seat should be hinged or the front riser be removable, so as to allow of the pail being removed, or, a door can be made in the back or side wall of the privy to remove it. The privy should be lighted, and ventilated near the roof, the floor should be paved with flags, or tiles, &c., and should be 6 inches above the yard level with a fall or slope towards the door. The space under the seat should also be paved with non-absorbent material, and be 3 inches above the level of the ground. The walls should be con-

structed of good hard bricks 9 inches thick, with flagged or slated roof. The receptacle itself is limited to two cubic feet capacity by the Model By-Laws.

17 Q.—To what points should attention be given in the construction of a w.c.? State for what class of building a trough closet is most suitable.

A.—(*a*) It should be placed close to an outside wall, and if possible separated from the rest of the house by a passage cross ventilated; the closet itself should be provided with a window two square feet in area and capable of being opened. The w.c. basin should be either a properly constructed valve closet, or (where this is too expensive) a pedestal wash-down with a good large area of water to receive the soil and prevent fouling of the sides. It should be supplied with a three-gallon flush of water from a small water-waste-preventing cistern, and the soil-pipe should be outside the house, and be carried upwards full size above the roof, if possible without bends, to a height of two feet above all windows and chimneys, unless a long distance away from them.

(*b*) The trough closet is suitable for factories, schools, and some public buildings.

18 Q.—Describe briefly the main features of the following water-closets, viz.:—"Valve," "Plug," "Long and Short Hoppers," "Wash-out," and "Wash-down." Also give a sketch of a wash-down w.c.

A.—(*a*) The valve closet consists of an enamelled earthenware basin which is kept about two-thirds full of water by a valve at the outlet. By means of a "pull" this valve is depressed within a box under the basin, and thus the water and soil are discharged into the trap below. The valve box is made of cast-iron, enamelled inside. A lead safe should be fixed under all valve closets to prevent leakage from the basin going through the ceiling into the room below, when the closet is out of order. The plug closet is also termed the trapless closet. The water seal is maintained by a plug which is fixed in a chamber on one side. It is not safe to connect this closet without a proper trap, of S or P shape, as foul air can gain access when the plug is lifted, if it is so connected; also, a match or other small substance getting between the plug and its socket prevents it from shutting

properly and thus allows the water forming the seal to escape and the foul air to pass directly into the house. Long and short hoppers are composed of two pieces, the basin and trap being separate. The long hopper is a bad shape, as, owing to its length it is seldom, if ever, properly flushed and the surface becomes very foul; this should not be allowed. The short hopper is a great improvement, and is a suitable w.c. for outside water-closets. The wash-out and wash-down are somewhat similar to the short hopper, only they are in one piece of earthenware, both trap and basin; that is, they are what are termed pedestal water-closets. The wash-out is a bad form of w.c., as it is hardly ever flushed out properly with the first flush of water. The basin is so formed as to hold a certain quantity of water which is held back from escaping into the trap by a weir. It is the lifting out of this water, soil, &c., that breaks or destroys the main force of the flush and the soil, &c., drops into the trap below and simply forces out the excreta, &c., left there by the person using it before and remaining in the trap for the next flush to force it out.

The wash-down has the advantages of the wash-out without its disadvantages, that is, it has a water receiving area to prevent fouling of the sides, and it is all in one piece, but the flush acts directly upon the water in the trap and basin, and a three-gallon flush never fails completely to change the contents of the trap and basin.

(*b*)

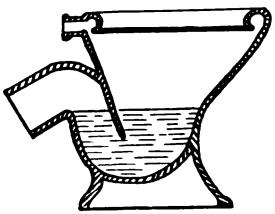


FIG. 21.

19 Q.—How many gallons of water should cisterns used for flushing water-closets discharge each time the closet is used? Give a sketch of a water waste-preventing cistern.

A.—(*a*) Wherever possible not less than $2\frac{1}{2}$ or 3 gallons; the latter is best.

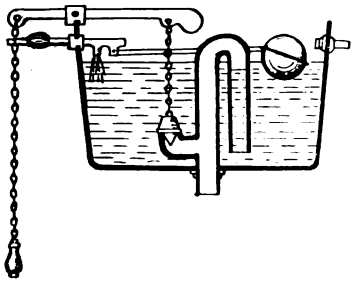


FIG. 22.

Q. —Name the principal methods of sewage disposal, and briefly outline the same.

A.—Sewage should first be screened to rid it of straw, sticks, rags, &c. It should then be allowed to stand for a certain length of time quietly in tanks to allow the solids to settle to the bottom. This is termed "precipitation," and is generally assisted by the addition of lime, alum, salts of iron, or other substances, either singly or in combination; the solids settle to the bottom in the form of sludge, and the liquid above is left comparatively clear. The sludge is pumped up, after draining it, to a pit and pressed into moulds for sale to farmers for manure. In some cases the top liquid is run off direct into a river or stream, in others it is further treated by one of the following methods:—Land filtration, broad irrigation, or artificial filtration. The best method cannot be stated lightly, as it depends upon the character of the sewage. In land filtration, or intermittent downward filtration, as it is sometimes called, the sewage is flowed over the land at intervals of so many hours, with rest between, effluent drains are laid 5 or 6 feet below the surface to collect the effluent after filtration through the soil; the land is often cultivated. In broad irrigation the process is very similar to land irrigation, with the difference that greater attention is paid to the cultivation of the land, and the land used is very much greater. The effluent drains are usually about 3 or 4 feet deep; the quantity of land required is about one acre for every hundred of the population. Artificial filtration used to consist of sand and gravel filters in combination with charcoal or polarite, &c.,

but less expensive materials are now used. Sand and gravel act at first as mechanical strainers, but later they are made to act chemically by the bacteria which develop in the interstices. Open bacteria beds are used from 3 to 6 feet in depth, the sewage first entering the coarser beds and then finer beds, which consist of coke breeze, burnt ballast, &c. This method is termed the Sutton or Dibdin system, and also the aerobic system, because in this system both light and air are admitted to the beds freely. In the anaerobic system, or septic tank method, both light and air are kept from the bacteria. This is accomplished either by open or by closed beds, or tanks; in the open tanks the inlet and outlet are submerged below the level of the surface, and a scum is allowed to accumulate on the surface to keep out the air and light.

21 Q.—Given three drains of 3 inches, 4 inches, and 5 inches diameter converging to a common point, what diameter must the pipe be to carry off the delivery of these three when flowing full?

A.—This can be answered in two ways, viz., by calculation or graphically. To do it by calculation, square the diameters of all the three drains and add the results together; by extracting the square root, the diameter of the fourth pipe equal in sectional area to all the others appears, as follows: $3 \times 3 = 9$, $4 \times 4 = 16$, $5 \times 5 = 25$, and $9 + 16 + 25 = 50$; the square root of 50 is 7·08 inches approximately, or say 7 inches; but as this size of drain is not general, an 8-inch or 9-inch drain would be used. By graphic methods, draw two lines at right angles to each other, one 3 inches and the other 4 inches long; then draw the diagonal line completing the triangle, measure this line to the same scale with which the other two have been drawn, and it will be found to be 5 inches in length. This equals the diameter of a pipe which will be the same area as the 3 and 4 inches combined. Now, if this process is repeated by again drawing two lines at right angles, the length of one line to be the diameter of the pipe which has just been found to be equal in area to the other two, namely 5 inches, and the length of the other equal to the diameter of the third drain given, namely 5 inches, and a diagonal line again drawn and measured, it will give the diameter of the pipe which is equal in area to all the three pipes given, and it will be found to be slightly over 7 inches long (*see* Figs. 23 and 24).

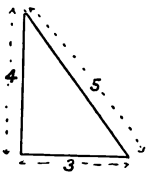


FIG. 23.

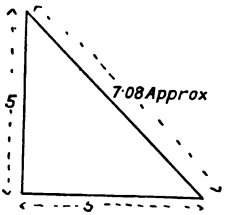


FIG. 24.

22 Q.—What objections are inseparable from cesspools? Give the cubic feet capacity of the receptacle in a privy built in accordance with the model by-laws, with fixed receptacle.

A.—(*a*) Storing sewage close to dwellings, and the nuisance caused by emptying the cesspool.

(*b*) Eight cubic feet, so as to necessitate their being emptied weekly.

23 Q.—Sketch and describe a pan-closet, giving your objections to the same.

A.—(*a*)

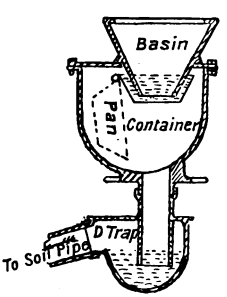


FIG. 25.

(*b*) The pan-closet should be unhesitatingly condemned; it is generally found connected to a D or helmet trap. The basin is fixed on the top of a large cast iron vessel, called a container or receiver. A movable copper pan holds the water in the basin; this pan is pivoted on one side, and when the pull of the closet is raised the pan describes a quarter circle, and its contents are suddenly dashed to the bottom of the container, and some of the fæcal matter

splashes on the bottom and sides of the latter, and on the underside of the pan, giving off foul smells into the house every time the pull is raised. It will be seen at once what a filthy and insanitary w.c. this is, and if no trap is fixed under it foul smells from the drain can enter the house when the pan is depressed.

24 Q.—State the number of gallons it would take to fill a 6-inch drain 20 feet long, giving calculations.

A.—First find the cubic contents of the drain in feet and multiply by 6·25, the quantity of gallons (approximately) contained in one cubic foot. The area of 6-inch drain $= \cdot5 \times \cdot5 \times \cdot7854 = \cdot19635$ of a square foot.

Multiply this by length of the drain in feet thus: $\cdot19635 \times 20 = 3\cdot927$ cubic feet in drain. Now multiply this by $6\cdot25 = 24\cdot54375$ gallons required to fill the drain, or $24\frac{1}{2}$ gallons approximately.

LESSON IV

SANITARY BUILDING CONSTRUCTION

1 Q.—Which are the best materials for soil-pipes? Give your objections to seamed lead for this purpose. State how soil-pipes should be ventilated. What diameter of pipe is necessary?

A.—(*a*) Drawn lead and cast iron of water-main strength coated inside with Dr. Angus Smith's solution or glass lined.

(*b*) Seamed lead is always liable to open along the seam or joint, by expansion and contraction.

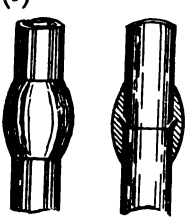
(*c*) Soil-pipes should be ventilated by being carried up full size higher than the roof of the building, they should be as free from bends as possible, and be so placed that the foul air is not discharged near or into open windows or chimneys; where the roof overhangs the wall run the soil-pipe straight through without bends.

(*d*) Four inches.

2 Q.—Which is the best joint for a lead soil-pipe? Also give sketches of wiped and copper-bit joints, and describe how iron pipes should be jointed.

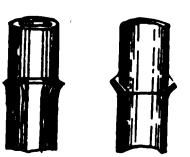
A.—(*a*) The wiped joint.

(*b*)



Elevation Section

FIGS. 26 & 27.—Wiped Joint.



Elevation Section

FIGS. 28 & 29.—Copper-Bit Joint.

(*c*) First insert the spigot end of the upper pipe into the socket end of the lower pipe, and ram a few rings of spun yarn down to the bottom of the socket to prevent the molten lead running into the pipe. The molten lead is now run into the joint and afterwards well caulked. The socket should be at least 2 inches deep.

3 Q.—Show by a sketch how cistern overflows should be dealt with; and also state whether the practice of utilising the downspout as a drain ventilator is a good one, and if not, why not?

A.—(*a*)

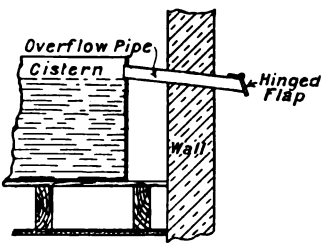


FIG. 30.

(*b*) This practice is not a good one, because foul smells from the drain can ascend the pipe and find their way into the house through open windows and doors, as the joints in the rainwater pipes are not made air-tight. Also the foul air can escape out of the top end of the pipe and under the eaves or slates of the roof, and thus into attics, &c.

4 Q.—To what points would you specially direct your attention in inspecting the sanitary condition of a dwelling-house?

A.—Outside the house I should note the position of the soil-pipes, ventilation shafts, waste-pipes from baths, sinks, wash-basins, cistern-overflows, &c.; see if the drain is disconnected from the sewer by an intercepting trap, with a fresh-air inlet. See if any cesspools, privies, middens, &c, are near the house, and note whether the roof looks good or defective, or the walls damp. Inside the house I should examine the cellar floors and walls for signs of dampness. Gullies or drains under the floor can often be detected by dampness or a settlement of the tiling or flagging; see that cellars are ventilated. On the floors above, note position, trapping, flushing and ventilation of w.c.s, baths, sinks,

wash-basins, &c. I should see that the w.c.s are cut off from storage cistern by small water-waste-preventing cisterns, and that the overflows are cut off short after going through the external wall. I should see that all rooms without fireplaces are adequately ventilated, and the rooms not over-crowded; see that all windows open, and that the water-supply is satisfactory. Lastly, I should see that the spouting and guttering are in good condition, and if there is a damp-proof course.

5 Q.—Describe how waste-pipes from baths, sinks, &c., should be dealt with. Is there any objection to their contents being discharged into the soil-pipes?

A.—Waste pipes from baths, sinks, wash-basins, &c., should be of lead, say 1½ inches in diameter. They should be trapped immediately under the sink, &c., with a lead S or P trap the same diameter as the waste-pipe. The trap should have an access eye soldered at its lowest point to clear it if it is ever obstructed. The top end of the pipe should be opened out trumpet or funnel-shaped so that a larger grate, perforated, can be fixed in the outlet of the sink, thereby more effectually flushing the pipe. After leaving the trap the pipe should be taken immediately through an external wall (and all sanitary fittings should be fixed close to external walls) and be cut short off over a glazed stoneware channel, leading to a proper trapped gully 18 inches distant, or, in the case of a large hotel or mansion, to a grease trap.

(*b*) They should not be allowed to discharge into the soil-pipe or into any drain until disconnected in the way described above, as if the back pressure is very strong there is not sufficient depth of water in the S or P trap to resist it, also the traps may become unsealed through neglect and other causes. An exception is made in the case of the waste-pipe from a slop sink, which is treated just the same as a pedestal w.c., only the waste-pipe need only be from 2 inches to 2½ inches diameter.

6 Q.—Which of the following soils would you consider healthy for building sites: gravel, sandy, peat, clay or chalk?

A.—A gravelly or sandy soil is perhaps the best if of considerable depth and on a slight slope. Sand is also a warm site. Clay is damp and unhealthy unless thoroughly drained, and it is cold unless covered over with a layer of good Portland cement concrete. Chalk is dry and healthy if it is of good

depth. Peat land and all soils which contain much vegetable or animal matter are unhealthy.

7 Q.—Describe the various methods of testing drains.

A.—Drains when open in the trenches should be tested by the water or hydraulic test; when covered or filled in, by the smoke test, which also acts as a test for the vent shafts and soil-pipes. To test by water the lower end of the drain must be stopped by means of a plug or bag and the drain filled with water to above the highest joint. Some put a vertical pipe at upper end to put more pressure, or head as it is called, but this is not necessary, as if the drain is stopped it overflows from the gulleys, &c. Some authorities also say that all gulleys, &c., should be unsealed to prevent air-lock in the branches, between the water in the gulleys and the rising water in the drain; in my opinion this is unnecessary, for, if the airlock occurs the branch is air-tight, which is quite as good as being water-tight. To apply the smoke test properly one of the smoke machines is necessary. Smoke is blown in by it at the lower end of the drain (or at any unsealed gully or trap) as soon as smoke is seen to issue from the top ends of the soil-pipes and vent-shafts, they are stopped up and search is begun for any leakages either inside or outside the house.

Some authorities use smoke rockets, but they are not so good as a machine as the amount of smoke is limited, whereas with a machine smoke can be blown into the drain as long as you wish.

Sometimes old drains can be tested with water, either with or without the addition of colouring substances, by simply pouring it down the drain and looking where it is thought the leakage occurs; this is sometimes useful where a drain passes along a passage and the leakage occurs into a cellar. There is also the oil of peppermint test, which consists of mixing a few ounces of it with a bucket of water, say in the w.c. inside the house, pouring it down the w.c. and immediately covering the pan over with a damp rag and keeping door and window tightly shut to keep in the smell. This is not a good method, as it is very difficult to prevent the smell from escaping into the rest of the house. Of course the person pouring down the peppermint must not come out of the room until all is complete otherwise the smell would come with him. A much better test than the last is to insert a Banner's hand-grenade over the trap of w.c., or gulley, by

means of a round wooden ball called a "drain explorer," to which a string is attached, for the double purpose of breaking the glass tube holding the chemicals (which is termed the grenade) and also to draw back the ball when the test is complete.

8 Q.—State how you would test bricks and slates for building construction.

A.—The bricks should be hard, well burnt, and not misshapen; they should be uniform in size, with flat surfaces, out of winding, and have sharp arises and square angles They should give out a clear ringing sound when knocked one against the other, and not absorb more than one-sixth their own weight of water. Slates also should give out a clear ringing sound when knocked with the knuckles: they should be non-absorbent, flat, and out of winding, without iron pyrites and streaky markings; they should not be earthy or soft, but hard.

9 Q.—What is the object of footings and concrete under walls? Also what is a damp-proof course, of what materials is it composed, and what position should it occupy in a wall?

A.—(*a*) Footings are the bottom courses of bricks or stones. They are spread out wider than the thickness of the wall on both sides to distribute the weight over a larger area and thus prevent the wall sinking; concrete is sometimes spread under walls for the same purpose.

(*b*) A damp-proof course is a course or layer of imperishable and non-absorbent material inserted in a wall to prevent damp rising from the ground up the wall. Various materials are used for this purpose, such as a course of glazed stoneware slabs, lead, asphalt, pitch and tar sanded over, a double course of slates laid in Portland cement mortar, &c. In buildings without cellars the proper position is 6 inches above the ground, but below the floor timbers. In buildings with cellars, or with the ground floor below the ground level, two damp-proof courses should be inserted, one below the cellar floor and the other just above the ground level; the wall between the two should be a cavity or hollow wall, or else a vertical damp-proof course should be put from one horizontal damp-proof course to the other inside the thickness of the walls.

10 Q.—Specify the chief causes of damp walls, and give different methods of preventing or remedying the same.

A.—(*a*) The chief causes of damp walls are as follows: no damp-proof course, walls too thin, or built of pervious materials, defective roofs and gutters.

(*b*) Remedies are to fix a damp-proof course or courses, excavate soil and build dry area round house, repair roof and gutters when defective; where walls are too thin or pervious, or in very exposed situations, they should be slated, tiled, weather-boarded, cemented or tarred. It is a good plan to construct new buildings with hollow walls, and a damp-proof course should be fixed at the top between the ceiling joists and roof timbers.

11 Q.—Name the best material for cellar floors.

A.—Cellar and basement floors are best formed with 6 inches of good Portland cement concrete rammed solid. The top surface may be floated to a smooth surface with cement and sand, or wood blocks may be laid on concrete in a mixture of pitch and tar or composition. This makes the floor warmer; it is clean, noiseless, and does not harbour vermin.

12 Q.—State why some wall-papers are dangerous to health.

A.—Because some coloured wall-papers contain arsenic and there is no simple method of testing them. They should be obtained from reliable firms with a guarantee, and if any doubt exists a sample should be analysed.

13 Q.—How should water-pipes be protected against frost?

A.—Outside the house they should be 2 feet 6 inches below the ground, and inside they should not be fixed against external walls if it can be avoided. When unavoidable they should be fixed on a board at least 1 inch thick, and in cold or draughty places they should be wrapped with felt or cocoa-nut fibre, or a box formed around them and filled with sawdust.

14 Q.—What additional pipe should be fixed when two or more water-closets are connected to the same soil-pipe? What is it called, what size should it be, and what position should it be placed in? How do you deal with its upper end?

A.—When two or more w.c.s are fixed on the same soil-pipe a pipe should be connected to the traps on the drain or sewer side. It is called an anti-syphonage or airpipe, and the

object is to prevent the lower w.c. traps being syphoned when the upper w.c.s are flushed. It need not be more than $2\frac{1}{2}$ inches diameter and should not be less than 2 inches. It should be fixed to the top of the trap on its outlet side, and can either be carried up, like the soil-pipe, higher than the roof, or be connected to the soil-pipe above the topmost water-closet. It should receive a branch pipe from each water-closet trap in its upward course.

15 Q.—How should soil-pipes be attached to the wall?

A.—Lead soil-pipes are usually attached to walls by means of "tacks;" these are pieces of lead soldered to the pipe and nailed to the wall with flat-headed nails. Iron pipes when of rainwater strength are made with ears or lugs cast on with nail-holes to allow of pipes being nailed to the wall, but when of water-main strength patent fastenings of different forms are used. Iron pipes should be fixed several inches from the wall so that the back can be painted.

16 Q.—What is ground air, and how can its access to houses be prevented?

A.—Ground air is the air which is intermixed with the soil from its surface down to the level of the ground water or subsoil water. When the ground or subsoil water rises the ground air is discharged into the atmosphere, but it can be prevented from rising into houses if the whole site is covered with a layer of Portland cement concrete or asphalt, of sufficient thickness and rammed solid.

17 Q.—Sketch and describe the proper method of jointing an earthenware closet pan to the branch of a lead soil-pipe.

A.—(*a*)

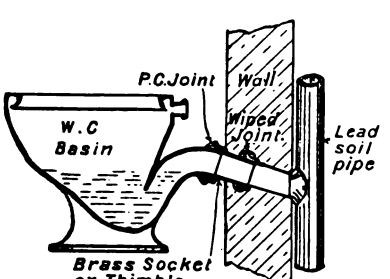


FIG. 31.

(*b*) Where one of the various patent joints, such as Doulton's metallo-keramic joint is not used, the proper way is to make a wiped soldered joint between the lead branch and a brass or gun-metal thimble, or socket-piece ; a Portland cement joint can be made between the thimble-piece and the w.c. outgo.

18 Q.—Sketch and describe the method of jointing a 4-inch lead soil-pipe to a 6-inch stoneware drain.

A.—(*a*)

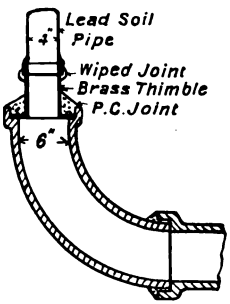


FIG. 32.

(*b*) This joint, like the last, is best made with the help of a brass or gun-metal thimble-piece, only it should have no socket. The bottom end of the lead soil-pipe is opened out to receive the end of the thimble, and a wiped joint is made here; the lower end cf the thimble has a flange, which in this case should be about 8 inches in diameter ; this rests in the socket end of the 6-inch bend of the drain, a Portland cement joint should be made here. A thimble with a flange about 6 inches in diameter should be used when the bend is 4 inches diameter, or what is called a taper, or diminishing bend.

19 Q.—How can the access of sewer air to houses be prevented ?

A.—By disconnecting the house drain from the sewer by means of a properly ventilated intercepting trap. Also, in addition, all waste-pipes from sinks, baths and lavatories should be properly trapped and disconnected over open channels 18 inches distant from trapped gullies. All drains should be kept outside the house, the drain and soil-pipe should be properly ventilated by carrying the shafts higher

than the roof, clear of all chimneys, and windows that open.

20 Q.—Sketch a plan of drainage suitable for a two-storeyed house, one in the middle of a terrace: the main sewer running down the road in front of terrace.

A.—

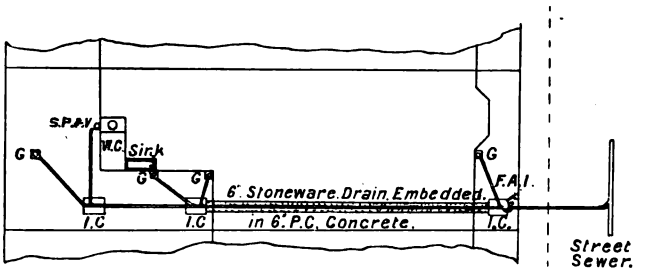
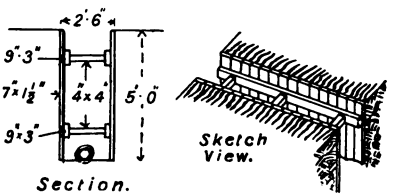


FIG. 33.

G. Gully. *I.C.* Inspection Chamber. *S.* Interceptor Trap. *S.P. & V.* Soil-Pipe and Vent. *F.A.I.* Fresh Air Inlet.

21 Q.—A house drain has to be laid in bad, wet ground, at a depth of, say, 5 feet. Show by sketches how the trench should be timbered and the drain laid, with dimensions and description of the work.

A.—(*a*)



FIGS. 34 & 35.

(*b*) Close boarding should be used when the ground is very loose; in quicksand, grass or litter is also used by forcing it in the joints or behind the boards. Drain pipes with patent joints should be used so that no cement is required. The Stanford, Doulton, or Hassell patent joists are suitable for this class of work.

22 Q.—Mention the respective advantages and disadvantages of cast-iron and stoneware drain pipes for house drainage purposes. In what lengths are these pipes usually made? Of what material and in what manner are the joints of each respectively made?

A.—(*a*) The advantages of cast-iron drain pipes over stoneware are many and the disadvantages few.

(1) Iron pipes are made in 6-feet lengths and even longer, while stoneware pipes are usually in 2-feet lengths, hence drains made with the former have correspondingly fewer joints. As the joints are the weakest parts this is a great advantage.

(2) Cast-iron pipes are not crushed by pressure from above, like stone-ware pipes are.

(3) The joints are not broken by careless filling in (or ramming) the ground over them, as stoneware pipes often are.

(4) Drains made with properly jointed cast-iron pipes do not readily leak; whereas stoneware pipes with cement joints may soon become defective and leaky owing to the shrinkage of the cement, or to the collars (or sockets) being broken off by its expansion. The advantages of stoneware pipes over cast-iron are, first, they are cheaper to buy, and cheaper to lay, as a labourer can and does, lay and joint them, whereas a plumber is required to properly lay cast-iron pipes; and interceptors, gullies, &c., are cheaper; and cutting the pipes to the length required is cheaper and quicker. Second, there is no liability to rust as in cast-iron pipes (unless the latter are treated inside and out to prevent this, a proceeding which adds to the cost).

(*b*) As stated above, the stoneware pipes are usually in 2-feet lengths, although they are also made in 3-feet lengths. Cast-iron pipes are made in lengths of 6 feet and 9 feet.

(*c*) The joints of the stoneware pipes are usually made by first inserting the spigot end of one pipe into the socket of the other, then ramming in all round a few strands of spun yarn steeped in cement grout, and, lastly, finishing the joint off at an angle of 45 degrees, with neat Portland cement, or Portland cement and sand in equal portions. The joints of cast-iron pipes are made by running into the joint molten lead, and caulking them tight with a special bent caulking tool.

23 Q.—Sketch and describe good and suitable sanitary accommodation for a factory where the hands employed are of both sexes?

A.—(*a*)

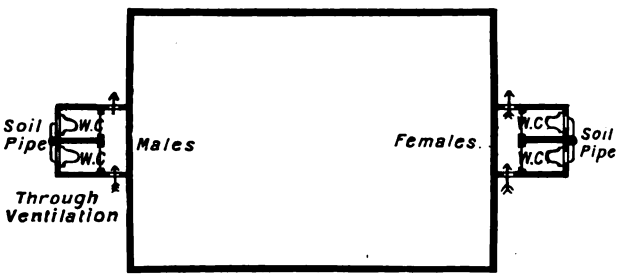


FIG. 36.

(*b*) As the number of persons employed is not stated, two w.c.s. are shown at one end of the room for males, and two at the other end for females. In most factories there are more females than males. If the seats are made to lift up, automatically or otherwise, in the men's w.c.s, they can be used as urinals also; if they are not so made, separate urinal accommodation must be provided. The w c.s are built out as an annexe to the main building (storey above storey); the soil-pipes should be outside and carried higher than the roofs. If more than one storey high, an anti-syphonage pipe should also be carried up, and all the w.c.s connected to it. The passage or lobby between the room and the w.c.s should be provided with louvred ventilator openings, for cross, or through, ventilation. It should be plainly set forth on the door from the room which are for males, and which for females.

Pedestal wash-down w.c. basins must be provided, with straight backs; a water-waste-preventing cistern should be connected thereto with a $1\frac{1}{2}$-inch flush pipe, at least 4 feet 6 inches above the basin. A notice should be fixed in each w.c. requesting persons to flush the same after using. For one-storey buildings trough closets are suitable.

24 Q.—Two semi-detached villas belonging to different owners are drained as indicated on this plan, Fig. 37, the drains

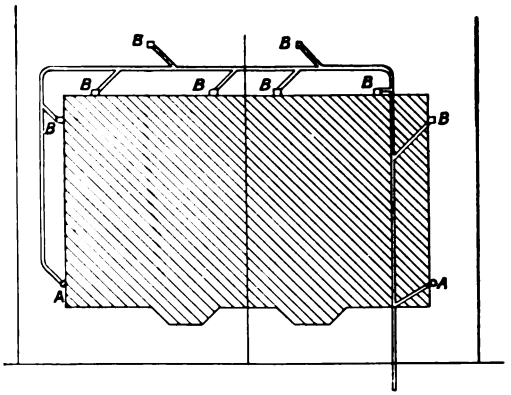


FIG. 37.

A. Soil-Pipes. *B*. Rain-Water and Surface Gullies.

require to be entirely reconstructed. Make a sketch and explain how this should be done.

A.—(*a*)

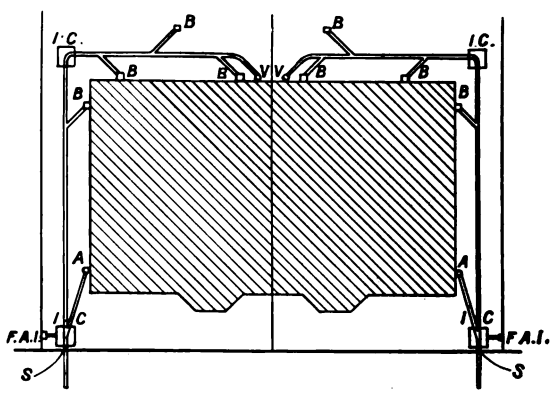


FIG. 38.

I.C. Inspection Chamber. *S*. Interceptor. *F.A.I.* Fresh Air Inlet. *V*. Soil-Pipe. *B*. Gully. *V*. Vent-Pipe.

(*b*) All the drains should be taken up and two new drains laid from the street sewer, along the side of each house. An

intercepting trap should be fixed in a manhole or inspection chamber immediately inside the front garden wall. The drain should then be continued straight to the rear corner of the house, and a second inspection chamber built there; the gullies on this side would have to be connected to this length of drain, but the soil-pipe should be taken separately into the first manhole. The drain is then continued from the second manhole along the rear of each house until it passes the furthest gully, when it should be directed to the rear wall of the house and finish at a 4-inch ventilating pipe; as the soil-pipe is not near the head of the drain an additional vent shaft is required. The drain could be 6 inches in diameter from the sewer to the first manhole, and beyond that it need only be 4 inches throughout.

LESSON V

INFECTIOUS DISEASES, DISINFECTANTS, ETC.

1 Q.—What is meant by the "period of incubation," and the "period of invasion" in the case of an infectious disease?

A.—(*a*) The period of incubation is the time which elapses between the introduction of the contagion into the body and the disease manifesting itself.

(*b*) The period of invasion is the time between the period of incubation and the time when symptoms peculiar to the disease in question become manifest. This period ends in the convalescence or death of the patient.

2 Q.—The period of greatest danger varies in different diseases. Explain this in the case of measles, whooping-cough, typhus, and enteric or typhoid fevers.

A.—The period of greatest danger from the point of view of infection in measles and whooping-cough, corresponds with the early stage of the disease; whereas in typhus and enteric fevers, it corresponds with the acute stage.

3 Q.—What are the advantages of isolation and quarantine?

A.—The patient or person infected is kept from mixing with others, and persons known to have been in the company of the person affected are kept away from others until the period of incubation time has passed, when it can be seen whether they have become infected or not. By isolation of the person affected and the placing in quarantine of any suspected of being affected, the Local Authority can prevent the spread of infectious diseases to a great extent.

4 Q.—When is there most danger of infection spreading in the case of smallpox? In visiting a house where there was a case of smallpox what particulars would you ascertain?

A.—Smallpox is highly contagious from the first, but it is

considered more dangerous in the later stages and during convalescence.

(*b*) If the case has not been notified by a medical man to the Medical Officer of Health, it will be necessary to take name of patient, nature of disease (small-pox in this case), name of medical attendant (if any), situation and kind of house, viz., whether a through or back-to-back house. Names of owner and tenant of house, number of rooms, lodgers (if any), number of family, schools they attend, and where they work, nature of water-supply, drainage, and sanitary condition of the house generally.

5 Q.—What are the chief causes of the spread of scarlet fever?

A.—Children being allowed to run and play about, or attend school when actually in the peeling stage, the disease not being notified to the Medical Officer of Health, and the room, clothing, bedding, &c., not being disinfected. The milk-supply, when infected, may cause an epidemic.

6 Q.—Specify the main points requiring attention to prevent the spread of diphtheria.

A.—The first and most important point is isolation of the patient, as in all other infectious diseases; other points are the thorough disinfection of the bedding, clothing, and room used by the patient, paying special attention to the discharges from the throat and nostrils by using clean rags, and then burning them immediately. The milk-supply should be investigated, as milk has been known to spread this disease; the sanitary condition of the premises should be inquired into; and all animals liable to infection, such as the cat, removed and isolated.

7 Q.—How is the prevalence of measles and whooping-cough chiefly accounted for?

A.—Neglect, improper treatment, and insanitary conditions. No attempt is made at isolation in the majority of cases, as the disease is often so slight as to be regarded as a cold, and the child is allowed to play with other children as usual, thus causing the spread of the disease.

8 Q. How is the infection given off in the case of enteric (typhoid) fever? and what preventive measures should be taken?

A.—(*a*) The infection is chiefly, if not entirely, given off by the discharges from the bowels of persons affected.

(*b*) The patient should be removed to hospital, or otherwise isolated; and the bedding, clothing, and room disinfected. All soiled bedding and clothing of little value should be burnt. Special attention should be given to the bowel discharges, all of which should be received into a vessel containing some liquid disinfectant (as a 1 in 1000 solution of corrosive sublimate), and be well mixed therewith. This should be buried away from houses and water-supply when in the country, and in towns when properly disinfected, it can be put down the drain, which should be well flushed afterwards. Where pail closets are in use, a special pail should be used, which should have its contents burnt in a destructor (if possible), or buried (as before mentioned).

9 Q.—In what respect does cholera resemble enteric fever?

A.—Cholera resembles enteric fever in the manner in which the infection is chiefly given off. This is by the discharges from the bowels.

10 Q.—What are the usual conditions favouring the disease known as typhus fever? and how is the poisonous matter given off in this disease?

A.—(*a*) The usual conditions favouring this disease are filth, overcrowding, want of ventilation; all or any of which are aggravated by a low state of living.

(*b*) Although no pathogenic microbe is yet known, there appears to be no doubt that there is one, and that it is given off by the breath of the patient, and possibly by exhalations of the skin and the excreta.

11 Q.—Is tuberculosis (generally called consumption) an infectious disease, and name the chief causes of this disease.

A.—(*a*) Yes.

(*b*) The chief cause of this disease is the tubercle bacillus or germ, but there are many conditions which favour the growth of this germ in certain people. There is first of all an undoubted hereditary predisposition to the disease—*that* is a special weakness of the body to resist the germ is handed down from parents to children. Many trades favour the growth of this disease, also overcrowding and want of ventilation. It is most prevalent in damp houses and localities, and it is possible that the eating of meat and drinking of the milk from infected animals may also cause the disease. Another name for this disease is phthisis.

12 Q.—How is the infection chiefly given off in the case of the following diseases; small-pox, scarlet fever, diphtheria, measles, and whooping-cough?

A.—In small-pox, by the breath and by the scabs when separating and drying. In scarlet fever, by the breath, the discharges from the throat, and especially by the peeling of the skin in the later stages of the disease. In diphtheria, by the discharges from the throat and nostrils. In measles, by the breath, and, in whooping-cough, by the breath and the discharges from the throat.

13 Q.—Briefly outline the advantages of the compulsory notification of infectious diseases.

A —The advantage is that early notification is thus given to the Medical Officer of Health, so that immediate steps can be taken by him and the sanitary staff to check the spread, by, if possible, removing the patient to the hospital, and, if not, by seeing that isolation of the patient is carried out; and, if necessary, the placing in quarantine of those known to have been in contact with the patient; and the disinfection of the room, clothing, bedding, &c.

14 Q.—Are authorities agreed that all infectious diseases are due to the introduction into the human system of living germs or their spores?

A.—Yes; although in some diseases it cannot be definitely stated how the infection is given off.

15 Q.—Give a list of the diseases enumerated as compulsorily notifiable in the Infectious Diseases Notification Act, 1889. Also state what diseases should, in your opinion, be added.

A.—(*a*) These are set forth in section 6 of the Act and are as follows: Small-pox, cholera, diphtheria, membraneous croup, erysipelas, and the fevers known as scarlet, typhus, enteric, relapsing, continued and puerperal.

(*b*) In my opinion the following should be added: Measles, whooping-cough, influenza, and tuberculosis.

16 Q.—State briefly the duties of an Inspector of Nuisances with regard to cases of infectious disease.

A.—In large towns the district inspectors will receive a list containing names and addresses of cases of infectious disease, when they should visit the houses as soon as possible and endeavour to induce the patient to be removed to the fever hospital, and also influence the friends of the person affected

to consent to the removal. This is also the first duty of an inspector in a rural or urban district, where a hospital is provided for the purpose. Any cases of suspected infectious disease discovered by the inspector (not notified) must at once be reported by him to the Medical Officer of Health, under whose orders and instructions he must act in all cases. He may have to remove the patient to the hospital himself; if not, he must inform the Medical Officer of Health at once, that the patient is (or is not) willing to be removed. He also attends to the taking away of the infected bedding, clothing, &c., and disinfects the same in a proper disinfecting apparatus, where one is provided; he also disinfects the room which has been occupied by the person infected, as soon as the latter leaves it. If the patient is kept at home he warns friends and neighbours against paying or receiving needless visits, &c. The inspector should also try to ascertain how the disease originated, whether apparently from some other person, or, from the existence of some nuisance in or about the premises. He should inspect the premises thoroughly and take down particulars as to the sanitary condition of the house, water-supply, and milk-supply; if the house be a through one, or a back-to-back house; the size and general condition of the rooms to see if any overcrowding exists. Number of persons in family, and age and sex, also of lodgers (if any), schools attended and also places of business, and any work or business carried on in the house should be noted.

17 Q.—What are the essential conditions of a true disinfectant; and which are the three most efficient chemical disinfectants?

A.—(*a*) Capability of destroying the germs and their spores. It must be applied to every part in sufficient strength and for a sufficient length of time.

(*b*) Corrosive sublimate is the best and most powerful; it occurs in white crystals, and is used in the strength of 1 part to 1000 of water. Formalin is the next, and this is a 40 per cent. solution of the gaseous compound known as formic aldehyde; it should be used in the strength of 2 parts to 100 of water. Chinosol (a patent) is the next, and is more efficient than carbolic acid; a solution of 1 in 150 is more effective than a 5 per cent. solution of the latter.

18 Q.—Is disinfecting by moist heat preferable to the dry method? Describe a reliable form of steam disinfecting apparatus?

A.—(*a*) Yes; because the penetrating power of moist heat is much greater than that of dry heat.

(*b*) Washington Lyon's apparatus consists of an oval chamber with double walls, with a door at each end opening into different rooms; the infected goods are put into the apparatus at one door and taken out at the other. The rooms should be entirely separate, with no communication except a fixed window. Steam is discharged into the apparatus by two pipes, one communicating with the cavity formed between the walls of the apparatus, and the other with the interior of the chamber; pressure-gauges are provided to indicate the pressure in each case. The makers recommend 30 lbs. per square inch in the cavity or jacket and 20 lbs. in the interior. The articles are placed in a wire cage or suspended from the rack provided for this purpose, and are then pushed into the chamber on rails. The articles can be left in to dry after being disinfected.

19 Q.—How should a room be disinfected with sulphur? And what quantity is required to disinfect a room of 1000 cubic feet?

A.—(*a*) This is done by setting fire to sulphur broken small and placed in an iron vessel, or vessels, according to the size of the room, after pasting up all chinks around the windows, &c., and stopping up the fireplace and ventilators, &c. Add a little methylated spirit to facilitate lighting, and after lighting, leave the room quickly and paste brown paper all around the door. To prevent fire the vessel should be placed on two bricks standing in a tray of water, the sulphurous acid gas is more effective in the presence of moisture.

(*b*) Authorities differ; some say 1 lb. of sulphur to every 1000 cubic feet of space, while others say at least 3 lbs. per ditto; but most are agreed that this process has little germicidal power.

20 Q.—How is chlorine gas obtained for fumigation purposes; and what time is required for the disinfection of a room with this gas?

A.—Chlorine gas is given off when chloride of lime is moistened with a little dilute sulphuric, or strong hydrochloric, acid. The most convenient method for fumigation purposes is to add 1½ to 2 pints of the acid to 1 lb. of the lime for each 1000 cubic feet of space. A shallow vessel should be used (not metal). As this gas is very poisonous the operator

should have all ready, and the door open so as to leave the room quickly when he has poured on the acid. Stop all openings as for sulphur fumigation. The room ought to remain closed for twelve hours.

21 Q.—What powers have local authorities to disinfect rooms?

A.—Section 120 of the Public Health Act, 1875, gives power to local authorities to serve notice, upon either owner or occupier, requiring him to cleanse and disinfect, upon the certificate of a Medical Officer of Health or other medical practitioner, that the cleansing and disinfecting of any house or part thereof, and of any articles therein, would tend to prevent infectious diseases. A penalty is incurred by default, and the Sanitary Authority may do what is necessary and recover the costs, or may undertake this duty in the first instance, with the consent of the occupier, at their own cost. In districts where the Infectious Diseases Prevention Act, 1890, is adopted, the above section is repealed, and upon the certificate of a medical practitioner the sanitary authorities may, after twenty-four hours' notice to the owner or occupier, proceed to carry out such disinfection or cleansing, unless within that time he informs the Sanitary Authority that he will within a period fixed in the notice himself do it to the satisfaction of the Medical Officer of Health. If he fails to do this, the officers of the Sanitary Authority may do it under the superintendence of the Medical Officer of Health, and the expenses may be recovered. Power of entry between the hours of 10 A.M. and 6 P.M. is given for this purpose.

22 Q.—In what way would you proceed to disinfect clothing after a case of infectious disease?

A.—All the clothing should be sent to be disinfected by means of a proper disinfecting apparatus where one is provided. The same van should not be used for carrying away infected clothing, bedding, &c., and for bringing back the same when disinfected. Where there is no proper apparatus, all articles of little or no value should be burnt, and all other clothing except blankets, flannels, &c., should be boiled for at least 10 minutes. Blankets, flannels, carpets, &c., should be soaked in a solution of corrosive sublimate of a strength of 1 in 1000, and then well washed in cold water, and hung outside exposed to the sun as long as possible (for some hours at least).

23 Q.—May an infectious disease be caused, or conveyed, through the milk-supply? if so, how?

A.—Milk may be affected by diseased conditions of the cow, or animal yielding it. Milk from cows suffering from foot-and-mouth disease should not be consumed as food; it may cause disease in human beings. Tuberculosis in cows is said to affect the milk yielded by them, especially when the teats are affected, and may lead to the same disease (consumption) in man. There is reason to believe that scarlet fever, diphtheria, enteric fever, and also cholera are in many cases either caused or conveyed by the milk becoming infected either direct from the animal, by the use of polluted water, or by persons handling it when suffering from the disease.

24 Q.—What powers are vested in local authorities with respect to the prevention of infectious and epidemic diseases?

A.—If adopted, the Infectious Diseases Notification Act of 1889 gives power to compel the notification of infectious diseases. Also, if adopted, the Infectious Diseases Prevention Act 1890 provides for inspection after 24 hours' notice, *see* answer No. 21 in this lesson. The Public Health Act 1875 is not an adoptive Act, and applies to all sanitary authorities in England and Wales (except London). Section 120 gives power to cleanse or disinfect rooms or to compel owner or occupier to do so, *see* answer No. 21 in this lesson. Section 120 gives power to sanitary authorities to destroy infected bedding or clothing, &c., and gives compensation. Section 122 gives sanitary authorities power to provide a disinfecting apparatus and disinfect free of charge. Section 123 gives power to sanitary authorities to provide an ambulance and pay expenses of conveyance of infectious persons to hospital. Section 124 provides that where a hospital is provided within a convenient distance, a justice may, on the certificate of a medical practitioner, order the removal of any person who is suffering from any dangerous infectious disorder, and is without proper lodging or accommodation; or is lodged in a room occupied by more than one family; or is on board any ship or vessel. Section 125 provides that the sanitary authorities may make regulations for removing to any available hospital, and for keeping there as long as necessary, any person brought within their district by vessel who is infected with a dangerous infectious disorder. Section 126 makes it unlawful for any person suffering from any dangerous infectious disorder to expose himself wilfully,

without proper precautions against spreading the disorder, in any street, public place, shop, inn, or public conveyance, or to enter any public conveyance without previously notifying the owner, conductor, or driver thereof that he is so suffering; or, being in charge of such sufferer, to expose such sufferer, or to give, lend, sell, transmit or expose without previous disinfection any bedding, clothing, rags, or other things which have been exposed to infection from any such disorder. Section 127 provides for penalty on failing to disinfect public conveyances so used. Section 128 provides for penalty against letting houses or rooms where infected persons have lodged, without being properly disinfected to the satisfaction of a medical practitioner, as testified by certificates signed by him. Section 129 provides for penalty for letting such houses on false statements. Section 142 provides for the removal of a body of one who has died of infectious disease and is retained in a room in which persons live or sleep, or which is in such a state as to endanger the health of the inmates of the house or room in which it is retained; in either of which cases a justice may, on a certificate signed by a medical practitioner, order it to be removed to a mortuary, or direct the same to be buried within a specified time.

LESSON VI

FOOD INSPECTION, DISEASES OF ANIMALS, ETC.

1 Q.—Describe the successive steps you would take in inspecting, seizing, and obtaining the condemnation of diseased, unsound, or unwholesome meat.

A.—The Medical Officer of Health or Inspector of Nuisances may, at all reasonable times, Sundays included, inspect and examine any meat exposed for sale, or deposited in any place presumably for the purposes of sale as, or preparation for, human food, and if it appears to him to be diseased, unsound, or unwholesome, he may seize it and carry it away, or cause it be carried away to be condemned by a magistrate, and after (not before) the justice has condemned it, he may destroy it. If obstruction be offered to his examination or seizure he must apply to the justice for a summons; this is equivalent to a right of entry though such right is not expressly given. If he has reason to suspect that unsound food is kept or concealed on any premises, he may obtain from a justice a warrant to enter such premises, search for, and carry away, any unsound food, to be condemned by the justice. Obstruction in this case is penal but there is no penalty beyond the destruction of the unsound food if it was not offered for sale.

2 Q.—Give the Act and section under which unsound meat may be seized; and state how the same has been extended by a more recent Act.

A.—(*a*) Section 116 of the Public Health Act 1875 gives power to the Medical Officer of Health or Inspector of Nuisances to examine at all reasonable times, any animal, carcase, meat, poultry, game, flesh, fish, fruit, vegetables, corn, bread, flour, or milk exposed for sale or deposited for the purpose of sale, or preparation for sale, and intended

for the food of man, and if found unsound, or unwholesome, he may seize it as stated in the previous anwer.

(*b*) This section has been extended by section 28 of the Public Health (Amendment) Act, 1890 (where adopted), to apply to all articles intended for the food of man, sold or exposed for sale, or deposited in any place for the purpose of sale, or of preparation for sale, within the district of any local authority, and a justice may condemn any such article, and order it to be destroyed or disposed of, if satisfied that such article is diseased, unsound, or unwholesome, or unfit for the food of man, although it may not have been seized as mentioned in section 116 of the Public Health Act, 1875.

3 Q.—What are the characteristics of good meat? and describe the appearance of a healthy carcase.

A.—(*a*) It should be firm and elastic, moist but not wet, red throughout in colour, except in the case of pork, veal, and lamb; if well fed it will be marbled by veins of fat in the muscles. It has a fresh, not disagreeable smell; it should "set" in 24 hours. The meat juice should slightly redden blue litmus paper showing it to be faintly acid.

(*b*) A sound, healthy carcase should be well set as soon as it is thoroughly cool; it should also be well bled, no part of it being purple, brown or speckled. One side or quarter should not be darker than the other. It should not be bile stained, and not markedly attenuated. The muscles on being pressed with the fingers should not pit, as this indicates the presence of water; and should not crackle, as this indicates the presence of air. The offal should also be inspected. The mouth and tongue should be free from blisters and blotches, the hoofs should be firmly attached to the feet. The hide should be free from sores and pimples. The lungs should be of a bright pink colour, spongy, free from cavities, pus (matter) or worms. A portion cut off should float in water. The heart should be free from bile-staining and blotches. The liver should be of a rich brown colour, should not break down easily under pressure, and should be free from abscesses and flukes. The spleen or milt should be of a dark colour inside, and gray on the outside, thin, long and sharp at the edges. The stomach should not be inflamed, nor the lining readily rub off, and it should not smell of drugs. The bowels should have a smooth uninflamed lining, free from ulcers or blotches.

4 Q.—Describe the characteristic appearance of a healthy animal; and, has an inspector power to seize a living animal?

A.—(*a*) The animal should be well nourished, able to rise without difficulty, and to walk without lameness. Its coat should be in good condition, its skin supple, without sores, scabs or boils. Its eyes should be bright, its mouth and nostrils moist but free from discharge. It should breathe easily, almost noiselesly, and its breath should be without odour. It should not shiver or give any indication of being in pain.

(*b*) Yes, he has power; but it will not often happen that he is called upon to examine or seize a living animal, and if possible he should consult the Medical Officer of Health or a veterinary surgeon before seizing it.

5 Q.—Name the chief causes from which meat may be unwholesome, and give an instance of the fraudulent sale of meat by substitution of one kind for another.

A.—(*a*) It may be partially decomposed through being kept too long; or it may be from an animal which has died a natural death, or only been slaughtered when in a dying state, or it may be derived from an animal affected with a disease, or be from a poisoned animal.

(*b*) The selling of horseflesh when beef is asked for and wanted.

6 Q.—Describe the difference beween ox-flesh, bull-flesh, and horse-flesh.

A.—Ox-flesh when good is bright red in colour (*see* answer to question No. 3); bull-flesh is tougher, coarser, and darker than ox-flesh; horseflesh is also coarser than ox-flesh, and there is a total absence of the small layers of fat between the muscle. It has also a characteristic odour, and the fat is darker, softer, and more oily than the fat of ox-flesh. It also has a peculiar horsey flavour.

7 Q.—How would you distinguish between refrigerated and non-refrigerated beef?

A.—Refrigerated or frozen beef can be distinguished by the fat, which is all more or less apt to be covered with red serum. Also, through defects in transit, sound meat may arrive covered with blue mould. Similarly, through being carelessly stored on arrival the surface may be allowed to grow moist and tainted, whilst the carcase remains sound.

It is also the case that frozen meat, which looks very well on the surface, may be a little "gone" near the bone in the centre; thus no examination of frozen meat is quite satisfactory unless the carcase or piece be cut through. American-killed carcases are known through being bruised about the legs, by which they are hoisted previous to slaughter.

8 Q.—In what way may articles of food preserved in tins become injurious to health? How could you tell without opening if the contents of a tin had undergone putrefaction?

A.—(*a*) Tinned food may become injurious to health if air gains access to the inside of the tins, through defects in the sealing process or by rough usage afterwards, or salts of tin, zinc or lead may be dissolved in the meat or jelly.

(*b*) If putrefaction or decomposition has actually commenced, the tin will show signs of pressure by being bulged out, instead of the ends being concave or hollow, caused by the vacuum inside. Also, if the tin be turned all round close to the nose, and there is the slightest hole in it, the contents will give off an offensive smell.

9 Q.—Describe the characteristic appearance of good and decomposing fish, and how you would proceed to satisfy yourself that a barrel of small fish, *e.g.*, sprats, was fit for food.

A.—(*a*) Really fresh fish is firm, crisp, and almost rigid. The drooping of the tail when the fish is held out horizontally may be taken as a measure of "unfreshness." The eye should be full and bright, the gills of a bright red colour, and it should give no particular odour. Decomposing fish gives off a disagreeable odour, and is very flabby and soft, the eyes are sunk and dull, and the gills of a dull red colour.

(*b*) If possible I should have the barrel opened first at one end and then at the other, or, if I had plenty of time, have it emptied out altogether to examine the fish, but fish soon smells when it commences to decompose, so that opening the barrel at each end and applying the nose would easily detect if any decomposition had set in; or, perhaps, simply boring a few small holes at various places in the barrel with a gimlet and applying the nose, would no doubt detect any unsoundness.

10 Q.—Are glanders and farcy the same disease, and how would you recognise them? What animals suffer from the disease and does it render the meat unfit for food?

A.—(*a*) Yes. They are two forms of the same disease; in glanders the chief symptoms are discharge from one or both nostrils, with ulceration of the nasal mucous membrane, and a swollen condition of the sub-maxillary gland situated on the inner side of the lower jaw. In farcy the symptoms are a swollen condition of the superficial lymphatic vessels and glands, which may often be seen standing out as tender nodulated cords. From these nodules or buds as they are termed, a sticky discharge very soon exudes, with more or less destruction of the skin. This may occur in any part of the body, but is most frequently seen in the hind legs, often accompanied by general swelling of the limb.

(*b*) This disease attacks horses, asses and mules, and may be communicated to man. The flesh should undoubtedly be condemned.

11 Q.—Name the diseases of cattle, sheep and swine, which more or less render the meat unfit for food.

A.—In cattle—cattle plague, or, as it is often called, rinderpest, pleuro-pneumonia, foot-and-mouth disease, anthrax or splenic fever, tuberculosis, actinomycosis (wooden tongue) and measles. In sheep—foot-and-mouth disease, sheep-pox (variola), anthrax, liver-rot (flukes). In pigs—swine fever (also called pig-typhoid, hog-cholera, purples, red-soldier, blue-soldier, and swine-plague), measles, trichinosis. Also in exceptional cases some of the above diseases may affect other animals, such as tuberculosis, which may attack sheep, pigs, and even horses; and actinomycosis, which may attack the pig and horse in exceptional cases.

12 Q.—Describe the various signs and appearances of ox-meat (1) when putrid, (2) when derived from an animal that has died of disease, (3) when of poor quality.

A.—(1) Meat actually putrid would of course never be offered for sale, as it would have turned a greenish colour, but before it quite reaches this stage it is partially decomposed, when it will be pale and livid on the outside, or the outside may be dark coloured, hard and dry. The meat also loses its elasticity, is soft and tears readily; partial decomposition is known mainly by the characteristic odour; on cutting it, the resistance to the knife varies, some parts being softer than others. The cut surface often swells from a kind of fermentation or "heating." The juice, too, is usually alkaline and fails to redden blue litmus paper.

(2) In cases of diseased animals it is very often difficult to detect by examination of the meat or flesh, as in some diseases the flesh is not affected unless the disease is far advanced. The flesh of animals suffering from any inflammatory disease is watery, and decomposes rapidly. In cattle plague, if the disease has been well developed, the flesh will be dark and flabby, it will not set well, it may crackle on pressure, owing to air in the tissues. In measles, the flesh when cut in sections is pale and flabby and looks dropsical. In trichinosis the flesh presents a speckled appearance, caused by the cysts, within which the little worms are coiled. In pleuro-pneumonia, if the disease is far advanced, the flesh may be dark in appearance, and the fat tinted yellow from bile-staining. In pneumo-enteritis, or swine-fever, if the illness has been protracted and severe, the flesh may appear pale, flabby and moist. In anthrax there may be swelling and tumours in various parts of the tissue, the tissue is watery, and the muscles friable, the blood is viscid in consistence, but it coagulates only imperfectly. It has a peculiar damson-like hue, and is sometimes tarry in character.

(3) Meat of poor quality is generally tough, coarse, and stringy; it is generally from aged animals, and will be wasted.

13 Q.—How would you recognise measles in a pig; and in what respect does trichinosis differ from measles? Should meat affected with these diseases be condemned?

A.—(*a*) Measles can easily be detected in pork on close inspection, as the meat looks speckled with little small white bodies or worms. The little white specks come out clearer if a very thin shaving of the meat be placed on a slip of glass and soaked for a short time in a weak solution of caustic potash. During life these worms or cysts may be found by examining the under surface of the tongue, which must be pulled out and fixed by inserting a piece of wood between the jaws.

(*b*) The small thread-like worms (*trichina spiralis*) which are the cause of the disease termed trichinosis, are found *within* the muscular fibres themselves, whereas in measles the cysts containing the worms (*cysticercus cellulosæ*) are situated *between* the muscle fibres.

(*c*) Yes. Meat infected with either of these diseases should be condemned.

14 Q.—How would you recognise foot-and-mouth disease, and should the entire carcase be condemned?

A.—(*a*) This disease principally attacks cattle, but sheep and pigs also suffer from it. Usually the only signs of this disease are to be found on the tongue and lining membrane of the mouth, between the claws of the hoof, and on the udders of cows. The eruption consists of blisters, and these break and form ulcers.

(*b*) As it has not yet been proved that the flesh is injurious, it is doubtful whether it should be destroyed or not, but there is no question as to condemning those parts of the animal which are affected by the disease.

15 Q.—Describe briefly the appearances of (*a*) liver fluke, (*b*) small-pox in sheep, and how would their presence affect the fitness of the meat as food?

A.—(*a*) This disease is caused by the presence of worms in the liver, and is also termed liver-rot. The worm, which is shaped like a sole, measures from an inch to an inch and a half in length, attaches itself to the bile-ducts inside the liver, and when present in large numbers chokes up the ducts, thus destroying the liver. This disease does not affect the quality of the flesh, unless it is so far advanced as to have caused the animal to become dropsical and bile-stained in which case it should be condemned. When it is confined to the liver, the liver only need be destroyed.

(*b*) This disease is very malignant and fatal to sheep, and renders the meat quite unfit for food. The chief feature of the disease is an eruption, which at first resembles flea-bites. These become solid pimples in which a clear fluid soon forms and then the fluid changes to pus (matter). Presently these break and discharge, scabs form which afterwards fall off. Apart from these signs the carcase does not present much change, except that the glands may be inflamed, and, if the animal has suffered severely the flesh will have a disagreeable odour.

16 Q.—How does cattle plague affect the quality of the meat as food? Describe the appearance of the meat affected with this disease, and is this disease known by any other name?

A.—(*a*) All authorities are agreed that the flesh of animals that have suffered from this disease should be condemned.

(*b*) The flesh does not change in appearance except when

the disease is advanced, when it becomes dark and flabby and has a disagreeable smell. It will not set well, and it may crackle on pressure owing to the presence of air in the tissues. Quite early in the disease the lining of the intestines and air-passages are reddened, and later on more general inflammation.

(*c*) Yes. This disease is also known as "rinderpest."

17 Q.—In inspecting a carcase to what points should particular attention be given to discover whether it is affected with pleuro-pneumonia or not, and how does this disease affect the quality of the meat as food?

A.—(*a*) The only thing noticeable about the meat is that it looks dark and ill bled, and this only when the disease is well advanced. The principal changes are in the lungs themselves; early in the disease the colour of the lungs is in great part grey, with red or purple patches or spots, and they are less spongy. Later they get darker in colour, and growing solid, like liver, will sink in water, the weight being much increased, viz., from 7 or 8 lbs. to 30 lbs. or more. The cavity of the chest will most likely contain water. If the lungs have been removed the lining membrane should be examined, as this will probably be thickened and roughened, as also will the interior of the chest walls.

(*b*) It cannot be proved that any injurious effects have been caused by the consumption of the flesh of animals suffering from this disease, but reasonable grounds exist for condemning it, as it is certainly not a sound article.

18 Q.—What appearances in the carcase would enable you to decide that a pig had suffered from swine-fever. If so affected would you condemn it, and is the disease known by any other names?

A.—(*a*) The disease does not necessarily produce any marked changes in the flesh, but the skin rarely escapes affording some indication of the disease; there is a general or patchy redness, or there are large livid blotches, or there is an eruption like small-pox, pus being secreted and crusts or scabs forming as in human small-pox. The red patches are not confined to the skin but may extend to the fat beneath. Marked changes will be found in the bowel, especially if the disease is far advanced, signs of inflammation are present

and often patches of ulceration. The lungs are usually congested or inflamed.

(*b*) Yes; I should unhesitatingly condemn the carcase.

(*c*) Yes; other names are "pig-typhoid," "hog-cholera," "red-soldier," "blue-soldier," "purples" and "swine-plague"; the proper name is pneumo-enteritis.

19 Q.—What are the chief differences in the carcase of the horse and the ox?

A.—The horse has eighteen ribs on each side while the ox has only thirteen; in the latter they are broader, flatter and less arched and are united to the cartilages by joints, while those of the horse have a fixed union. The breastbone of the ox is flat above and below while that of the horse is keel-shaped or flat sideways. The bones of the horse are mostly larger than those of the ox and contain more fatty matter of an oily consistence. The horse's tongue is broad at the end while that of the ox is pointed, and the upper surface of the tongue of the ox is rough. The liver of the ox forms one continuous mass with one small segment or lobe at the upper and back part; it has a gall-bladder attached. The liver of the horse is formed of three large lobes and a small one; it has no gall-bladder. The heart of the ox is more conical or pear-shaped than that of the horse, and in its base it has a bone which is not found in the heart of the horse.

20 Q.—Name the diseases of the cow which may render the milk unfit for food.

A.—Cattle plague, pleuro-pneumonia, foot-and-mouth disease, garget (or inflammation of the udder), tuberculosis, puerperal fever and anthrax.

21 Q.—Describe briefly the appearance of the lungs of an ox affected with tuberculosis, and explain what is meant by "stripping" when a carcase is prepared for sale.

A.—(*a*) Rounded growths at first scarcely visible to the naked eye form in the tissues. These increase in size until as large or even larger than a pigeon's egg. It is these growths that cause this disease to be known as the "grapes" and "pearl disease." These small growths when cut into have a yellow appearance and sometimes a cheesy consistency, at otner times they are hard and gritty. As the disease advances the lung is apt to break up and abscesses may form

in its substance. The favourite site for the growths is on the surface of the lung and on the walls of the chest, they afterwards invade the interior of the lung, giving rise to inflammation of that organ.

(*b*) The butcher often removes the lungs and strips the internal covering from the chest walls before offering the carcase for sale. A careful inspection of the chest-walls and the damping with a wet cloth will make the torn fibres become opaque, and thus it will be seen that the lining (or pleura) has been removed.

22 Q.—Describe the characteristic appearance of a carcase affected by anthrax. Should it be condemned, and what disease does this produce in man?

A.—(*a*) Anthrax attacks cattle, sheep and swine. There are three forms: (1) the least frequent is marked by large boils; (2) black-quarter, one limb or more dark and swollen; (3) splenic fever; flesh dark, bile-stained and dropsical. Liver large and soft, lungs generally inflamed. Spleen enlarged to twice or thrice its natural size, and edges rounded.

(*b*) Yes; the flesh should be unhesitatingly condemned.

(*c*) Woolsorter's disease.

23 Q.—Large numbers of carcases of calves are imported into this country from abroad at a certain period of the year. Under what conditions would you consider such carcases unfit for human consumption?

A.—I should consider that they were unfit for human food if I found that the animals had suffered from any such disease as tuberculosis, anthrax, foot-and-mouth disease, cattle plague, &c., and also if they were what is termed "slink" meat, that is, cast prematurely or dying during or soon after birth. I should notice the hoofs and bowels (if present with carcase); the former should have hardened and the latter have passed the black slimy matter, if not I should seize it as unfit for food.

24 Q.—How would you recognise actinomycosis and hydatid cysts? Should the flesh of animals suffering from these diseases be condemned?

A.—(*a*) Actinomycosis specially affects the ox and is caused by the "ray fungus"; it mostly attacks the tongue and adjacent tissues, including the jaw, but it may invade the bones, and also the lungs. The tongue is hard and dense

(wooden tongue) and very much enlarged, so much so that it may protrude from the mouth, and on being cut into it presents a nodular appearance. When the disease occurs in the lung it is likely to be mistaken for tuberculosis, which it closely resembles. Hydatid cysts are a dangerous parasite affecting the liver and other parts of the body under the name of hydatid disease. It affects the dog and wolf only, so that good reasons exist for excluding dogs from slaughter-houses. The head of the worm (it is a tapeworm) is similar to that of the *tænia solium* of measles, but it is only $\frac{1}{100}$ of an inch in width. There are four segments only, and the whole tapeworm is about a quarter of an inch long.

(*b*) There is no doubt that all parts affected should be seized and condemned, but opinions differ as to condemning the whole carcase, some maintaining that the whole carcase should be seized and destroyed.

LESSON VII

DUTIES OF AN INSPECTOR OF NUISANCES, ETC.

1 Q.—What is the legal designation of an inspector appointed under the Public Health Act, 1875, and the Public Health (London) Act, 1891?

A.—(*a*) Inspector of Nuisances (section 189 of the Public Health Act, 1875).

(*b*) Sanitary Inspector (section 107 of the Public (London) Act, 1891).

2 Q.—State the sources whence an inspector derives his powers, and give a brief statement of his duties as prescribed by the Local Government Order of March 23, 1891.

A.—(*a*) It is the Sanitary Authority that has the power, which is derived from the various Acts on Public Health, but especially the Public Health Act, 1875, for the provinces, and the Public Health (London) Act, 1891, for London. The inspector derives his power, or performs his duties, under the Sanitary Authority, the Public Health Acts, and the order of the Local Government Board as follows:

(*b*) 1. He shall perform either under the special directions of the Sanitary Authority or the Medical Officer of Health, or in cases where no such directions are required, without such directions, all the duties specially imposed upon an Inspector of Nuisances by the Public Health Act, 1875, or by any Statute or Statutes, or by the orders of the Local Government Board, so far as the same apply to his office.

2. Attend all meetings of Sanitary Authority when so required.

3. Inspect district systematically at certain periods, and at intervals, as occasion may require, to keep himself informed as to nuisances requiring abatement.

4. On receiving notice of existence of nuisance he shall visit the spot as early as possible and inquire into the same.

5. Report to Sanitary Authority any offensive trade established in the district, also breaches of by-laws in respect to the same.

6. Report to Sanitary Authority any damage to works of water-supply, wilful waste of water, or fouling of the same.

7. Inspect shops and places kept or used for preparation or sale of butchers' meat, poultry, fish, fruit, vegetables, corn, bread, flour, milk or any other article mentioned in Public Health Act, 1875, and examine any animal, carcase, meat, &c. &c., and if found unfit for food of man cause the same to be seized and dealt with by a Justice. In any case of doubt he shall report to the Medical Officer of Health, to obtain his advice thereon.

8. He shall, when and as directed by the Sanitary Authority, take samples of food, drink, or drugs, suspected to be adulterated and submit the same to be analysed.

9. Give immediate notice to the Medical Officer of Health of the occurrence in the district of any contagious, infectious, or epidemic disease. Also overcrowding in houses.

10. Attend to instructions of the Medical Officer of Health as to proceedings to be taken to prevent spread of any contagious, infectious, or epidemic disease of a dangerous character.

11. Enter his inspections in a book, also action taken. Also keep a book, or books, so as to form a continuous record of premises in respect of which action has been taken.

12. Produce his books and render information to the Medical Officer of Health when required so to do.

13. If directed by the Sanitary Authority he shall superintend works undertaken under their direction for the suppression or the removal of nuisances.

14. If directed by the Sanitary Authority he shall act as officer of the said authority under the Contagious Diseases (Animals) Act, 1886, &c.

15. In matters not specifically provided for in this Order, he shall observe and execute all lawful orders and directions of the said Sanitary Authority, and the orders of the Local Government Board, which may be hereafter issued applicable to his office.

3 Q.—Define "street," "house," "drain," and "sewer," according to the Public Health Act, 1875, and state in what way the term "drain" has been amended by a later Act.

A.—(*a*) "Street" is defined as including any highway (not

being a turnpike road) and any public bridge (not being a county bridge) and any road, lane, footway, square, court, alley, or passage, whether a thoroughfare or not. "House" includes schools, also factories and other buildings in which more than twenty persons are employed at one time. "Drain" means any drain of and used for the drainage of one building only, or premises within the same curtilage, and made merely for the purpose of communicating therefrom with a cesspool or other like receptacle for drainage, or with a sewer into which the drainage of two or more buildings or premises occupied by different persons is conveyed. "Sewer" includes sewers and drains of every description, except drains to which the word "drain" interpreted as aforesaid applies, and except drains vested in or under the control of any authority having the management of roads, and not being a Local Authority under this Act.

(*b*) Section 19 of the Public Health (Amendment) Act, 1890, where adopted, amends the term "drain" to include two or more houses connected to a public sewer by a single private drain, so that (on written application under section 41 as to nuisance), the local authority may execute works and recover costs.

4 Q.—Who is responsible for the maintenance and cleansing of sewers? And what power does the Public Health Act, 1875, give a Local Authority, to compel the owner or occupier of a house to provide a drain?

A.—(*a*) Every Local Authority shall keep existing sewers in repair and make such others as may be necessary (Section 15 of the Public Health Act, 1875); and they shall be constructed, covered, ventilated, and cleansed so as not to be a nuisance (section 19 of the Public Health Act, 1875).

(*b*) Section 23 of Public Health Act, 1875, gives power to the Local Authority to compel the owner or occupier of any house within their district to drain properly the said house into any sewer within a hundred feet of the site of the house, or, if no such sewer exists within that distance into a covered cesspool not under any house. The Local Authority may also make regulations as to how such work shall be carried out, and if not done in the time specified in the notice, the Local Authority may do the work and recover the cost.

5 Q.—Under what circumstances may a house drain empty into a cesspool? A w.c. on private premises is reported to the

Local Authority to be causing a nuisance, what power of entry has an inspector?

A.—(*a*) Only when the Local Authority have no sewer within a hundred feet of the site of the house, or there is no sewer to which they have the right of use, within that distance.

(*b*) Section 41 of the Public Health Act, 1875, says, that on a written complaint that any drain, water-closet, earth-closet, privy, ashpit, or cesspool is a nuisance or injurious to health, the Local Authority may empower their surveyor or inspector to enter the premises, after giving twenty-four hours' written notice, or, in case of emergency, without notice, and open the ground. If any defect is found, the Local Authority must serve notice upon the owner or occupier to amend the same within a reasonable time, and if not done, the Local Authority may execute the work and recover the expenses; and section 102 of the Public Health Act, 1875, says the Local Authority or any of their officers shall be admitted into any premises for the purpose of examining as to the existence of any nuisance thereon, between the hours of nine in the forenoon and six in the afternoon, or in the case of a nuisance arising in respect of any business, then at any hour when such business is in progress, or is usually carried on.

6 Q.—What provisions does the Public Health (Amendment) Act, 1890, contain dealing with the clogging of drains and sewers with solid refuse, and nuisances caused by the discharge into sewers or drains of chemical refuse or steam?"

A.—(*a*) Section 16 of the Public Health (Amendment) Act, 1890, says: "It shall not be lawful for any person to throw or suffer to be thrown, or to pass into any sewer of a Local Authority or any drain communicating therewith, any matter or substance by which the free flow may be interfered with, or by which such sewer, or drain, may be damaged.

(*b*) Section 17 of the same Act says: "Every person who turns or permits to enter, any sewer, of a Local Authority, or any drain communicating therewith, any chemical refuse, or any waste steam, condensing water, heated water, or other liquid, of a higher temperature than 110 degrees Fahrenheit, which either alone or in combination with the sewage, causes a nuisance, or is injurious, or dangerous to health, shall be liable to a penalty not exceeding £10, and a daily penalty not exceeding £5. The penalty under section 16 is £10 and a daily penalty not exceeding 20*s.*

7 Q.—Is the Public Health (Amendment) Act, 1890, a permissive

measure, and may the whole or any of the five parts be adopted by both Urban and Rural Authorities?

A.—(*a*) Yes; it is a permissive, not a compulsory measure, and is not in force in any district until one month after it has been adopted by resolution.

(*b*) An Urban Authority may adopt all or any of the five parts, and a Rural Authority may adopt Part 3 so far as it is declared by the Act to be applicable to such authority, without prejudice to the provisions of the Act relating to the investing of Rural Authorities with urban powers.

8 Q.—Define the term "sanitary convenience" under the Public Health Amendment Act, 1890, and state whether this Act gives Local Authorities greater power than they possessed under the Public Health Act, 1875, to deal with them.

A.—(*a*) The expression "sanitary convenience" includes urinals, water-closets, earth-closets, privies, ashpits, and any similar convenience.

(*b*) Yes; section 20 gives power to Urban Authorities to prevent public sanitary conveniences being erected in, or accessible from, any street without their consent in writing (except those erected by a railway company in their station yard or approaches thereto) under a penalty not exceeding £5 and a daily penalty not exceeding 20*s.*, so long as not removed after notice in writing to that effect from the Sanitary Authority. Section 21 gives power to impose penalty upon conviction, on any person who injures or improperly fouls any sanitary convenience used in common by two or more separate dwelling-houses, or by other persons, of not exceeding 10*s.*, and, if the walls, floor, seat or fittings thereof is, or are, in such a state as to be a nuisance for want of proper cleansing, each person having the use thereof shall be liable to a penalty not exceeding 10*s.* and a daily penalty not exceeding 5*s.* Section 22 provides for every building used as a workshop or manufactory to be provided with sufficient and suitable sanitary conveniences, having regard to the number of persons employed, and with separate accommodation for persons of each sex; penalty in default not exceeding £20 and a daily penalty not exceeding 40*s.* Section 23 gives power to Urban Authorities, to make by-laws for keeping of water-closets supplied with sufficient water for flushing, and the provision of secondary means of access, where necessary for removal of house refuse, &c., when laying out new streets.

9 Q.—Does the Public Health (Amendment) Act, 1890, prohibit the occupation as a dwelling or workroom, of a room built over an ashpit?

A.—Yes; section 24 of this Act says: "After the expiration of one month after adoption of this part of this Act, and after notice from Local Authority, of not less than seven days, any person who occupies, and any person who suffers to be so occupied, any portion of a room over any privy, cesspool, midden or ashpit, whether built before or after the adoption of this part of this Act, as a dwelling-place, or workroom, or place of habitual employment of any person in any manuture, trade or business, during any portion of the day or night shall be liable to a penalty not exceeding £2 and a daily penalty not exceeding 10*s.*"

10 Q.—Is it an offence under the Public Health (Amendment) Act, 1890, to build on ground partly filled in with animal or vegetable refuse?

A.—Yes; section 25 of this Act says: "It shall not be lawful to erect any new building on any ground which has been filled up with any matter impregnated with fæcal, animal, or vegetable matter, or, upon which any such matter has been deposited, unless and until such matter shall have been properly removed by excavation or otherwise, or shall have been rendered, or have become innocuous, under a penalty not exceeding £5, and a daily penalty not exceeding 40*s.*"

11 Q.—What power does the Public Health (Amendment) Act, 1890, give a Local Authority for dealing with insanitary courts and passages?

A.—Section 27 of this Act provides that where any court or passage, leading to the back of several buildings in separate occupations (and not being a highway repairable by the public), is not regularly and effectually swept and kept clean, and free from rubbish or other accumulation, to the satisfaction of the Urban Authority, the Urban Authority may, if they think fit, cause to be swept and cleaned such court or passage, and the expenses shall be apportioned upon the occupiers in such shares as may be determined by the surveyor to the Urban Authority, and such expenses may be recovered summarily.

12 Q.—How have the powers of a Local Authority, under section 44 of the Public Health Act, 1875, been extended by the passing of the Public Health (Amendment) Act, 1890?

A.—Section 26 of the Public Health (Amendment) Act, 1890, where adopted, gives the Urban Authority power to make bylaws for prescribing the times of removal or carriage through the streets of any fæcal, or offensive, or noxious matter, or liquid; also for providing that the vessel, receptacle, cart or carriage used shall be properly constructed and covered so as to prevent the escape of any such matter or liquid. Also for compelling the cleansing of any place whereon such matter or liquid shall have been dropped or spilt: or where the Local Authority themselves undertake or contract for the removal of house refuse, they may make bylaws imposing upon the occupier of any premises duties in connection with such removal so as to facilitate the work.

13 Q.—Where the w.c. accommodation of a house is reported to be deficient, what power has a Local Authority to deal with such a case? Define the terms "earth-closet" and "ashpit."

A.—(*a*) Section 36 of the Public Health Act, 1875, says: "If a house within the district of a Local Authority appears to such Authority by the report of their surveyor or inspector of nuisances to be without a sufficient w.c., e.c., or privy, and an ashpit furnished with proper doors and coverings, the Local Authority shall, by written notice, require the owner or occupier, within a reasonable time therein specified, to provide same; and if such notice is not complied with the Local Authority may do the work and recover the expenses in a summary manner."

(*b*) An earth-closet is defined as "any place for the reception and deodorisation of fæcal matter constructed to the satisfaction of the Local Authority." The term ashpit is extended by section 11 of the Public Health (Amendment) Act, 1890, to include any ashtub or other receptacle for the deposit of ashes, fæcal matter, or refuse.

14 Q.—Has the Local Authority power to make bylaws imposing upon the occupiers the duties of cleaning footways, removing house refuse, &c.?

A.—Yes. By section 44 of the Public Health (Amendment) Act, 1875, it is enacted that where the Local Authorities do not themselves undertake, or contract for, the cleansing of footways and pavements adjoining any premises, the removal of house refuse from any premises, the cleansing of earth-closets, privies, ashpits, and cesspools belonging to any premises, they may make bylaws imposing the duty of such

cleansing or removal at such intervals as they may think fit, on the occupier of any such premises.

15 Q.—Under what circumstances is a Local Authority responsible for the removal of refuse from premises, and does the term "refuse" apply to the refuse from any trade or manufacturing process?

A.—(*a*) Where they undertake its removal themselves, or contract for its removal, they are responsible for the removal of house refuse.

(*b*) No; it only applies to house (or domestic) refuse; and if the Local Authority were to remove trade refuse they could make a charge for same.

16 Q.—Can an Urban Authority order the periodical removal of manure from stables? Also state what notice is required to be given to any person for the removal of any accumulation of offensive matter on premises?

A.—(*a*) Yes; section 50 of the Public Health Act, 1875, gives power to Urban Authorities to give notice (by public announcement or otherwise) requiring the periodical removal of manure or other refuse matter from mews, stables, or other premises under a penalty not exceeding 20*s.* per day for accumulation.

(*b*) Under Section 49 of the Public Health Act, 1875, where it appears to the inspector of nuisances that any accumulation of manure, dung, soil, filth, or other offensive or noxious matter ought to be removed, he shall give twenty-four hours' notice to the person to whom the same belongs, or to the occupier of the premises where it exists. If not removed it is vested in the Urban Authority, who may sell or dispose of it.

17 Q.—Against whom should action be taken in the case of such nuisances as are specified in section 47 of the Public Health Act, 1875, and is proof of injury to health required?

A.—(*a*) Against the occupier.

(*b*) No; the section is as follows: "Any person who in any urban district—(1) Keeps any swine or pig-stye in any dwelling-house, or so as to be a nuisance to any person, or (2) suffers any waste or stagnant water to remain in any cellar or place within any dwelling-house for twenty-four hours, after written notice to him from the Urban Authority to remove the same; or allows the contents of any water-

closet, privy, or cesspool, to overflow or soak therefrom, shall for every offence be liable to a penalty not exceeding 5*s.* per day during which the offence is continued, and the Urban Authority shall abate the nuisance, or cause it to be abated, and may recover the costs in a summary manner.

18 Q.—How does the Public Health Act, 1875, define a nuisance?
A.—Section 91 of the Public Health Act, 1875, defines a nuisance as follows:

(1) Any premises in such a state as to be a nuisance or injurious to health.

(2) Any pool, ditch, gutter, watercourse, privy, urinal, cesspool, drain, or ashpit, so foul or in such a state as to be a nuisance or injurious to health.

(3) Any animal so kept as to be a nuisance or injurious to health.

(4) Any accumulation or deposit which is a nuisance or injurious to health.

(5) Any house, or part of a house, so overcrowded as to be dangerous or injurious to the health of the inmates, whether or not members of the same family.

(6) Any factory, workshop, or workplace not kept in a cleanly state, or not ventilated in such a manner as to render harmless as far as practicable any gases, vapours, dust, or other impurities, generated in the course of the work carried on therein, that are a nuisance or injurious to health, or so overcrowded while work is carried on as to be dangerous or injurious to the health of those employed therein.

(7) Any fireplace or furnace which does not as far as practicable consume the smoke arising from the combustible used therein, and which is used for working engines by steam, or in any mill, factory, dyehouse, brewery, bakehouse, or gaswork, or in any manufacturing or trade process whatsoever; and any chimney (not being the chimney of a private dwelling-house) sending forth black smoke in such quantity as to be a nuisance, shall be deemed to be nuisances liable to be dealt with summarily, in manner provided by this Act.

NOTE.—By the Quarry Fencing Act of 1887, any quarry dangerous to the public, in open or unenclosed land within fifty yards of a highway, and not separated therefrom by a secure and sufficient fence, shall be deemed to be a nuisance under the Public Health Act, 1875. Also, by the Housing of the Working Classes Act, 1885, a tent, van, shed, or

similar structure used for human habitation, which is in such a state as to be a nuisance or injurious to health, or which is so overcrowded as to be injurious to the health of the inmates, whether or not members of the same family, is also deemed to be a similar nuisance.

19 Q.—If you find a nuisance to exist on any premises, what steps would you take?

A.—On receipt of any information of the existence of a nuisance, or on finding any nuisance, I should if possible investigate the cause, and report the matter at once to the Sanitary Authority, who as soon as satisfied of the same shall serve a notice on the person by whose act, default or sufferance the nuisance arises or continues; or, if such person cannot be found, on the owner or occupier of the premises on which the nuisance arises, requiring him to abate the same within a specified time, and to execute such works and do such things as may be necessary for that purpose. If the nuisance arises from structural defect or want of structural convenience, or where there is no occupier, notice to be served on the owner. Where the person causing the nuisance cannot be found, and the nuisance does not arise or continue by the act, default, or sufferance of the owner or occupier of the premises, the Local Authority may abate the same without further order (Public Health Act, 1875, section 94). If this notice is not complied with, or if the nuisance, though abated, is likely to recur, the Local Authority shall make complaint to a justice, who shall summon the person on whom the notice was served (section 95). The Court may make an order dealing with the nuisance, or a recurring order, or both, and may also impose a penalty and give costs (section 96).

20 Q.—How would you deal with a nuisance arising from an accumulation of (*a*) refuse from a dwelling-house, (*b*) trade refuse?

A.—(*a*) If the Local Authority do this work themselves or employ a contractor I should report it at once to the clerk or the foreman responsible for the work. If the Local Authority do not do this work themselves, nor employ a contractor, I should serve a notice under section 49 of the Public Health Act, 1875, giving the owner or occupier twenty-four hours' notice to remove the refuse; also,

(*b*) Twenty-four hours' notice should be served under the same Act and section for the removal of trade refuse. (*See* Answer to Question 16 of this lesson.)

21 Q.—Define the terms "Local Authority," "lands," and "curtilage."

A.—"Local Authorities" are either Urban or Rural Authorities. The Urban Sanitary Authorities are districts and the rural Sanitary Authorities are districts. Urban districts are either boroughs or mayor, aldermen, and burgesses, acting by the council districts under an Urban District Council. Rural districts are areas which were previously under the guardians of union, and are now governed by Rural District Councils or "Lands" and "premises" are defined to include messuages buildings, lands, easements, and hereditaments of any tenure, "Curtilage" has been defined as a "courtyard, backside or piece of ground lying near to a dwelling-house" (WHARTON).

22 Q.—You are sent to take an hour's observation of the smoke issuing from a certain factory chimney. In what form would you make your notes as the observation proceeded, so that they could be referred to for evidence in a court of law?

A.—The inspector should have a pocket-book with lines ruled horizontally for a portion of the page, on which should follow consecutively the following:

Name of firm.
Description of works.
Where situate.
Number of observation.
Number of boilers.
Place of observation.
Date of observation.

The rest of the page should be in the form of a table for the duration of black smoke, &c., as follows:

Time.	Black.	Moderate.	None.	Total.		Longest continuous black smoke.	Remarks.
	M.	M.	M.	H.	M.	M.	

similar a state so over mates deem 19 Q.— s' A —Mention the statutory and other registers which should be kept by a sanitary inspector. Suggest a form for the gister of workshops which Sanitary Authorities are required keep under section 131 of the Factory and Workshops Act.

—(*a*) The following registers should be kept in a Sanitary or Public Health Department (of course, all the book-keeping could not be done by the sanitary inspector in a large town or district, so that some of these registers would be kept by the clerk or clerks):

Prosecution register;

Infectious diseases register;

Disinfecting register;

Registers of factories and workshops, also outworkers and contractors;

Registers of common lodging-houses and houses let in lodgings;

Register of cowsheds, dairies and milkshops;

Register of slaughter-houses and offensive trades;

Register for canal-boats used as dwellings, and

Register of persons from whom samples are purchased under the Food and Drugs Acts, articles purchased, and results of analysis. It would also be advisable to keep a register of places where horseflesh is sold.

(*b*)

WORKSHOP REGISTER.

BOROUGH OF ———

No.	Name of occupier and situation of factory or workshop	Nature of business.	No. of work-rooms.	Dimensions of work-rooms.	Cubical contents of work-rooms.	No. of workers allowed.	Remarks.

24 Q.—What are "back-to-back" houses? What are their sanitary disadvantages? How may the conditions of such houses be ameliorated without demolishing them?

A.—(*a*) Houses in which the rear or back walls form a party wall between them, that is, they have no open space in the rear.

(*b*) It is impossible to ventilate these houses thoroughly, no through draft is possible, as it is in a through house. Also, very often the drainage and sanitary conveniences are open to great improvements, as where these houses are built in blocks of four, with passages between each block, and bedrooms over the passages; the drains from the w.c.s run under this passage, and if any leakage takes place it finds its way into the cellars adjoining; also, the sinks of all four houses are grouped together and discharge over one common gully in the centre of the passage, which soon gets choked with coal dust, &c., and overflows into the cellars down the coal grates. The w.c.s (or very often the privies) and ashpits are situated in the yards fronting the back houses (there are front houses fronting the street and back houses facing the yards), and all the refuse, &c., is kept close to these back houses.

(*c*) Fix inlet and outlet ventilators such as Tobin's tubes and Boyle's mica flap valves in every room, and, if the houses are built in a long terrace, pull down one or two at intervals to allow of the free circulation of the wind to the rear. Lay drain embedded in 6 inches of Portland cement concrete, or iron pipes, to prevent leakage into the cellars; take down ashpits and substitute galvanised circular dust-bins, covered to keep out the wet, and empty weekly. If there are privies, convert them into water-closets.

LESSON VIII

COMMON LODGING-HOUSES, CELLAR DWELLINGS, ETC.

1 Q.—Define the the term "common lodging-house."
A.—There is no legal definition of a common lodging-house, but it has been defined as "that class of lodging-house in which persons of the poorer class are received for short periods, and, though strangers to one another, are allowed to inhabit one common room."

2 Q.—Can an inspector demand an entrance into a common lodging-house at any hour? and name the minimum cubic space allowance for each adult in sleeping rooms.
A.—(*a*) Yes. Section 85 of the Public Health Act, 1875, says: "All persons having, or acting in management of such houses, shall at all times, when required by any officer of Local Authority, admit him to any part;" penalty in default £5.

(*b*) The model bylaw of the Local Government Board allows 300 cubic feet for each adult.

3. Q.—What power has a Local Authority to require the keeper of a common lodging-house to obtain a proper water-supply, to limewash walls and ceilings, and to give notice of infectious disease?
A.—(*a*) Where a common lodging-house is without a proper supply of water for use of lodgers, and it appears to the Local Authority that such could be obtained at a reasonable cost, they may require the owner to provide same within a given time on pain of removal of house from register (section 81 of Public Health Act, 1875).

(*b*) Keepers shall limewash walls and ceilings in first week of October and April to the satisfaction of the Local Authority

on pain of a penalty of £2 (section 82 of the Public Health Act, 1875).

(*c*) All keepers shall immediately report to the Medical Officer of Health and Relieving Officer, any case of fever or infectious disease under a penalty not exceeding £5, and a daily penalty not exceeding £2.

4 Q.—Give briefly the rules in the model bylaws which should guide the inspector in his examination of premises to be registered as a common lodging-house.

A.—The house should possess the conditions of wholesomeness needed for dwelling-houses in general, and it should further have arrangements fitting it for its special purpose of receiving a given number of lodgers.

5 Q. On what matters are Local Authorities required to make bylaws for common lodging-houses?

A.—Section 80 of the Public Health Act, 1875, says: "Every Local Authority shall make bylaws for

"(1) Fixing and varying the number of lodgers and for separation of the sexes in common lodging-houses;

"(2) Promoting cleanliness and ventilation;

"(3) Notification and precautions in case of infectious disease;

"(4) The general well ordering of such houses."

6. Q.—You are asked to report upon the sanitary condition of a common lodging-house. State in detail the points to which you would draw attention.

A.—I should note the condition as regards cleanliness, lime-washing, &c., also look to the w.c.s, see that they were in a good, clean, and wholesome condition, and at least one for every twenty (registered) lodgers of each sex, and that there were separate w.c.s, &c., for each sex. I should see to baths (if any), sinks, and wash-basins, being clean, trapped, and disconnected. See to proper water-supply. Drain trapped from sewer and ventilated properly, soil-pipe outside, and above roof. See that all windows will open, and that no underground room is being used as a sleeping-room. Privies and ashpits to be kept clean and in good condition. Yards and areas to be kept clean and well paved. See that the house possesses kitchen and day-rooms in addition to sleeping rooms, &c.

7 Q. Draft what in your opinion would constitute suitable and sufficient headings for a register of houses let in lodgings.

A.—The following particulars should first be filled in on lines ruled horizontally:

Name and address of landlord
Situation of house
Total number of w.c.s in house, and where situate
Total number of floors, and of rooms, in the house
Total number of rooms let in lodgings
Means of entrance
Date

Signature of landlord

Then the rest of the page should be in the form of a table thus:

Rooms. No. of	Number of lodgers in each room.				Name of lessee of each room and amount paid per week.	Purpose room is used for.
	Men.	Women.	Children under 10 years.	Total statutory persons.		

8 Q. Draft suitable and sufficient headings for a page in a register for common lodging-houses.

A.

No.	Date of registration.	Name of keeper.	Situation of house.	No. of bedrooms registered for lodgers.	Dimensions of each room.	Cubical contents of rooms.	No. of lodgers allowed in rooms.

9 Q. What are the conditions on which a cellar dwelling may be occupied?

A. Sections 71 to 75 of the Public Health Act, 1875, deal with cellar dwellings. Cellars built or rebuilt since 1848 are absolutely prohibited from being used as dwellings, and, no cellar can be so used unless it fulfils the following requirements:

(1) Height not less than 7 feet; 3 feet to be above the ground level;

(2) There must be an area 2 feet 6 inches wide in every part in front of the cellar and 6 inches below the level of the floor;

(3) The cellar must be drained by a drain at least one foot below the level of the floor;

(4) There must be proper closet and ashpit accommodation;

(5) There must be a fireplace and chimney, and a window at least 9 square feet in area, made to open.

10 Q.—Under what circumstances can a Local Authority close a cellar dwelling; and, what is occupation?

A.—(*a*) Section 75 of the Public Health Act, 1875, says: "In case of two convictions for unlawful occupation within three months (whether the persons convicted were the same or not) Petty Sessional Court may close the room for a period or empower the Local Authority to close it permanently."

(*b*) Section 74 of the Public Health Act says: "Passing the night in a cellar is deemed occupying it as a dwelling."

11 Q.—What does the Public Health Act, 1875, state respecting steps in or over an area adjoining a cellar dwelling?

A.—Section 72 of the Public Health Act, 1875, says: "There must be a space of six inches between every part of the steps leading down to the cellar, and the wall thereof, and, the steps must not cross the window."

12 Q.—What is stated in the model bylaws respecting the use of screens, in sleeping-apartments set apart for married couples, in common lodging-houses?

A.—Beds used by married couples when in use, shall be effectually screened off from the view of any occupant of any other bed, by means of a screen or partition of wood or other solid material, which shall extend upwards throughout the whole length and breadth of such bed to a sufficient height above such bed and downwards to a distance of not more than six inches above the floor level.

13. Q.—Name the provisions in the model bylaws as regards the cleansing of floors, stairs, passages, and yards of a common lodging-house.

A.—Floors of rooms, stairs and passages, to be thoroughly swept once at least in every day, and before ten o'clock in the morning, and to be thoroughly washed once at least in every week. Yards, areas, forecourts, or other open space to be at all times kept in good order, and to be thoroughly cleansed from time to time as often as may be reasonably necessary, for the purpose of keeping the same in a clean and wholesome condition.

14 Q.—What time should the windows of sleeping-rooms in a common lodging-house be opened daily? and, are any exceptions allowed to this rule?

A.—(*a*) Every window in every room, in use and occupation as a sleeping-apartment, to be opened, and to be kept fully open, for at least one hour in the forenoon, and for at least one hour in the afternoon of every day.

(*b*) Yes; such window shall not be required to be opened, nor to be kept open, when the state of the weather is such as to render it necessary that the window should be closed, or, when any bed in such room may be occupied by any lodger in consequence of sickness, or of other sufficient cause.

15 Q.—Should the keeper of a common lodging-house be allowed to use a kitchen or scullery as a sleeping-apartment? and what is the age limit for children of different sexes being allowed to occupy the same sleeping-rooms as a married couple?

A.—(*a*) No; a keeper of a common lodging-house shall not at any time suffer, or cause, any room used as a kitchen or scullery, to be used as a sleeping-apartment.

(*b*) Ten years.

16 Q. What time should elapse after a bed has been vacated by an occupant in a common lodging-house before another person may occupy the same? State the cubic space allowance for children under 10 years of age.

A.—(*a*) 8 hours.

(*b*) 150 feet.

17 Q.—Does the number allowed to occupy a sleeping-room in a common lodging-house, depend altogether on the size of the room?

A.—No; this will depend partly upon the size of the room, and the facilities for ventilation, and partly upon the amount of accommodation of other kinds; as kitchen and day-room accommodation, w.c.s, &c.

18 Q.—State briefly the precautions that a common lodging-house keeper must take in the event of any lodger suffering from an infectious disease?

A.—Every keeper of a common lodging-house, immediately he is informed, or shall have ascertained, that any lodger is ill of any infectious disease, shall adopt all such precautions as may be necessary to prevent the spread. He shall not allow any person except wife or relation, or other person voluntarily in charge of such lodger, to use or occupy the same room. If the Sanitary Authority order the removal of such lodger to a hospital, such keeper on being informed of such order, shall forthwith take all such steps as may be requisite on his part, to secure the prompt and safe removal of such lodger, and adopt such precautions as are in accordance with any instructions he may receive from the Medical Officer of Health. If ordered by the Medical Officer of Health he shall at once cease receiving any more lodgers into such rooms. He shall immediately after the death, removal, or recovery of such lodger give written notice to the Medical Officer of Health, and shall have every part of the room, and articles therein, thoroughly cleansed and disinfected, and shall comply with all instructions of the Medical Officer of Health as to the proper cleansing and disinfecting.

19 Q.—Define the terms "lodging-house," "landlord," "lodger," and "exempted houses," in respect to houses let in lodgings.

A.—"Lodging-house" means a house, or part of a house, which is let in lodgings to, or occupied by, members of more than one family.

"Landlord" means the person by whom, or on whose behalf, such house, or part of a house is let, or who for the time being, receives, or is entitled to receive, the profits arising from such letting.

"Lodger" means a person to whom any room, or rooms, may have been let as a lodging, or for his use and occupation.

"Exempted houses" are houses where the rateable value exceeds (an amount to be specified) and the rent or charge

by each lodger (either inclusive or exclusive of any charge for the use of furniture) shall be at the rate, or in the proportion, of not less than (an amount to be specified per week).

20 Q.—For what matters is a Local Authority empowered to make bylaws affecting "houses let in lodgings?"

A.—By section 90 of the Public Health Act, 1875, the Local Government Board may, if they think fit, by notice published in the *London Gazette*, declare the following enactment to be in force within the district, or any part of the district, of any Local Authority, and, from and after the publication of such notice, such Local Authority shall be empowered to make bylaws for the following matters:

(1) For fixing, and from time to time varying, the number of persons who may occupy a house, or part of a house, which is let in lodgings or occupied by members of more than one family; or for the separation of the sexes in a house so let or occupied.

(2) For the registration of houses so let or occupied.

(3) For the inspection of such houses.

(4) For enforcing drainage, and the provision of privy accommodation for such houses, and for promoting cleanliness and ventilation in such houses.

(5) For the cleaning and limewashing at stated times, of the premises, and for the paving of the courts and courtyards thereof.

(6) For the giving of notices, and the taking precautions in case of any infectious disease.

21 Q.—What is the cubic space allowance for adults and children in houses let in lodgings?

A.—In rooms used exclusively as sleeping-apartments, 300 cubic feet for adults, and 150 cubic feet for children under 10 years of age. In rooms which are not exclusively used as sleeping-apartments 400 cubic feet for adults, and 200 cubic feet for children under 10 years of age.

22 Q.—What does the Public Health Act, 1875, say regarding the registering of common lodging-houses?

A.—Section 76 of the Public Health Act, 1875, says: "Every Local Authority shall keep a register of all common lodging-houses, number of lodgers that may be received, and names and addresses of keepers, &c." Section 77 says: "No one may

keep a common lodging-house unless he or she, and the house is registered," &c., and section 78 says: "No house shall be registered until it has been inspected and approved by some officer of the Local Authority, and the Local Authority may refuse to register any person without such certificate of good character as they may prescribe, signed by three inhabitant householders in the district, rated at £6.

23 Q.—A room in a common lodging-house is 20 feet square on plan, and the walls are 7 feet high; the ceiling slopes on every side to the centre of the room, where it is 12 feet high above the floor. What is the cubic contents of the room, and how many adults should be allowed to sleep in it?

A.—(*a*) Cubic contents of portion of room up to top of walls equals 20 feet × 20 feet × 7 = 2800 cubic feet. The portion above walls is a pyramid on a base 20 feet square and 5 feet high. To find the contents of a pyramid, find the area of base and multiply the result by one-third the height; or multiply by height and divide by 3; thus, 20 × 20 = 400 square feet. Multiply this (the area of base) by 5 (height) = 2000, and divide by 3 = 666·66 cubic feet. Add together the 2800 and the 666·66 = 3466·66 = cubic feet in room.

(*b*) If we take the room to be properly ventilated, and the other necessary accommodation to be satisfactory, we then allow the minimum of 300 cubic feet per adult person to sleep in room. Divide 3466·66 by 300 = 11 adults and 166·66 cubic feet over, which would allow for one child under 10 years of age, or would be fully taken up by beds, bodies of persons, &c.

24 Q.—Give a schedule, or notice, for a common lodging-house suitable for the sanitary authority to send to the keeper after they have registered him.

A.

SCHEDULE

District of

Common lodging-house situate at

Name of keeper

The maximum number of lodgers, authorised to be received at any one time into this house, is

The maximum number of lodgers to be received at any one time, into each of the several rooms in this house, is the number specified in respect of such room in the appropriate column of the following table.

	Description or number of rooms.	Dimensions or cubical contents of rooms.	Maximum number of lodgers.
Ground Storey			
First Storey			
Second Storey			
Topmost Storey			

For the purpose of this notice, every two children under the age of ten years may be counted as one lodger.

Witness my hand this day of 190 .

.....

Clerk to the Sanitary Authority.

LESSON IX

INFECTIOUS DISEASES ACTS

1 Q.—Do the provisions of the Infectious Diseases Notification Act, 1889, and the Infectious Diseases Prevention Act, 1890, only apply after adoption by a Local Authority; if so, state how they may be adopted?

A.—(*a*) Only after they have been adopted.

(*b*) Any Sanitary Authority may by resolution adopt all or any of the sections of these Acts. Fourteen days notice must be given of the meeting and business; the resolution when carried must be advertised in local newspapers, published by handbills in district, or otherwise, and come into operation not less than one month afterwards. A copy of the resolution must be sent to the Local Government Board.

2 Q.—Name the objects of the Infectious Diseases Notification Act, 1889, and the Infectious Diseases Prevention Act, 1890.

A.—The objects of the above Acts are, briefly, to secure the early notification, or knowledge, of the outbreak of infectious diseases, and thus to be able to take the necessary steps by isolation, disinfection, &c., to prevent the disease spreading.

3 Q.—Give a list of the diseases enumerated as compulsorily notifiable in the Infectious Diseases Notification Act, 1889.

A.—Section 6 of the Act gives the following as dangerous infectious diseases, viz., Small-pox, cholera, scarlet fever, typhoid or enteric fever, typhus fever, diphtheria, membranous croup, erysipelas, and the fevers known as puerperal, continued, and relapsing.

4 Q.—What are the powers of a Local Authority as regards ordering premises to be disinfected? Has section 120 of the Public Health Act, 1875, been repealed?

A.—(*a*) Section 120 of the Public Health Act, 1875, says: "Where the Local Authority is of opinion on the certificate of the Medical Officer of Health, or other legally qualified medical practitioner, that the cleansing and disinfecting of any house or part thereof, and of any articles therein, would tend to prevent the spread of infectious disease, it is incumbent upon the Sanitary Authority to serve notice upon the owner or occupier requiring him to cleanse and disinfect." Or, the Sanitary Authority may do the work, with the consent of the owner or occupier, at their own cost.

(*b*) No; it has not been repealed unless section 5 of the Infectious Diseases Prevention Act, 1890, has been adopted, when it is repealed by this section.

5 Q.—In what respects does section 5 of the Infectious Diseases Prevention Act, 1890, amend section 120 of the Public Health Act, 1875?

A.—By section 5 of the Infectious Diseases Prevention Act, 1890, on receipt of certificate the Local Authority shall give notice in writing to the owner or occupier that the Local Authority will cleanse and disinfect, at his cost, if he does not do it himself, within twenty-four hours, to the satisfaction of the Medical Officer of Health. If he fails to do so, the Local Authority may enter, by their officer, on producing written authority, do the work and recover the cost. It is section 17 of the Infectious Diseases Prevention Act, 1890, which gives power to enter.

6 Q.—State what powers a Local Authority has for dealing with infected bedding and clothing.

A.—Sections 121 and 122 of the Public Health Act, 1875, provide for the destruction, when necessary, of infected bedding and clothing (with due compensation), and also for disinfection of such articles in a proper place and with proper apparatus; the Local Authority may make a charge or not, as they please. Where the Infectious Diseases Prevention Act is adopted, section 6 extends the above powers, by permitting the Medical Officer of Health to direct in writing, such disinfection and adds a penalty for non-compliance. Compensation for any damage done by disinfecting is limited to unnecessary or avoidable damage.

7 Q.—In the case of a provision of the Infectious Diseases Notification Act, 1889, or of the Infectious Diseases Prevention

Act, 1890, being similar to some provision of a local Act, can proceedings still be taken under the local act?

A.—No; both these Acts supersede like provisions of local Acts, where they are adopted. (Section 14 of the Infectious Diseases Notification Act, 1899, and section 19 of the Infectious Diseases Prevention Act, 1890.)

8 Q.—Give the section and state the provisions of the Public Health Act, 1875, with regard to the exposure of infected persons and things.

A.—Section 126 of the Act says: "It is unlawful for any person, suffering from any dangerous infectious disorder, to expose himself wilfully, without proper precautions against spreading the disorder, in any street, public place, inn, or public conveyance, or to enter any public conveyance without previously notifying the owner, conductor, or driver thereof that he is so suffering, or, being in charge of such sufferer, to expose such sufferer, or to give, lend, sell, transmit, or expose, without previous disinfecting, any bedding, clothing, rags, or other things, which have been exposed to infection from any such disorder."

9 Q.—What notification of an infectious disease is required under the Infectious Diseases Notification Act, 1889?

A.—Section 3 of this Act says: "When any person is suffering from an infectious disease, the head of the family, or the nearest relative, or any person in attendance on, or in charge of, the patient, or the master of the house, shall, as soon as aware of the nature of the disease, send notice thereof to the Medical Officer of Health. Every medical man attending on, or called to, the patient, shall, in like manner, send a certificate stating full name, age, and sex of the patient, the full postal address of the house, and the nature of the disease." Also, whether in his private or official practice, &c. Any person failing to notify is liable to a fine not exceeding £2, unless they had good reason to believe that notice had been sent.

10 Q.—Under what circumstances may a person suffering from an infectious disease be removed to a hospital?

A.—The Public Health Act, 1875, section 124, provides that "Any person suffering from any dangerous infectious disorder, who is without proper lodging or accommodation, or lodged in a room occupied by more than one family, or is on board any ship or vessel, may, on a certificate signed by a legally

qualified medical practitioner, be removed to any hospital within the district of the Local Authority, or within a convenient distance outside the district, and to which the Local Authority have access or a right of use; also, any person so suffering who is lodged in a common lodging-house may be so removed."

Note.—There is no power of absolute compulsion given, but any person obstructing or wilfully disobeying the order made by a justice, or by the Local Authority, is liable to a penalty not exceeding £10.

11 Q.—State the law with regard to the infectious dead, and define the term "public conveyance."

A.—(*a*) Section 142 of the Public Health Act, 1875, provides that "where the body of one who has died of any infectious disease is retained in a room in which persons live or sleep, or any dead body which is in such a state as to endanger the health of the inmates of the same house or room, is retained in such house or room, any justice may, on a certificate signed by a legally qualified medical practitioner, order the body to be removed, at the cost of the Local Authority, to any mortuary provided by such Authority, and may direct the time in which the body is to be buried, unless friends or relations undertake to bury the body in the time stated, the relieving officer shall bury such body and recover expenses from any person liable to pay the expenses of such burial. Any person obstructing an order made by a justice under this section is liable to a penalty not exceeding £5." This section is supplemented by section 8 of the Infectious Diseases Prevention Act as follows: "No person, without the sanction in writing of the Medical Officer of Health, or of a registered medical practitioner, shall retain unburied elsewhere than in a public mortuary (or in a room not used at the time as a dwelling-place, sleeping-place, or workroom) for more than forty-eight hours, the body of any person who has died of infectious disease." Also section 11 of the Infectious Diseases Prevention Act provides that, "The body of any person who has died from an infectious disease must not be conveyed in any public conveyance other than a hearse, without due notice to the owner or driver, and he shall, under a penalty, at once cause the conveyance to be disinfected."

(*b*) A "public conveyance" is understood to be one which plies openly for hire.

12 Q.—Under what circumstances is the disinfecting of public conveyances required by law?

A.—Section 127 of the Public Health Act, 1875, provides that: The owner or driver of any public conveyance, after conveying an infected person, is required under a penalty to have the same disinfected, and is permitted to make an extra charge for conveying such a person. Also, a hearse must be disinfected after conveying the body of any person who has died from an infectious disease. (*See* last question and answer.)

13 Q.—Is it an offence to allow infectious rubbish to be cast into an ashpit?

A.—Yes; section 13 of the Infectious Diseases Prevention Act, 1890, provides that: "Any person who shall knowingly cast, or cause or permit to be cast, into any ashpit, ashtub, or other receptacle for the deposit of refuse matter, any infectious rubbish without previous disinfection, shall be guilty of an offence under this Act."

14 Q.—Is a Local Authority required to provide a temporary shelter, free of charge, for a family turned out of their dwelling for disinfection, &c.?

A.—Yes; where the Infectious Diseases Prevention Act 1890, is adopted, as Section 15 provides that: "The Sanitary Authority shall provide free temporary shelter, with any necessary attendance, for the members of any family in which infectious disease has appeared, who have to leave their dwelling to allow of its disinfection by the Sanitary Authority."

Note.—This is a wise provision, as otherwise the people would go into friends' and neighbours' houses, and thus spread the disease if any of them are affected.

15 Q.—What action can the Local Authority take against a person letting a house wherein an infectious disease has occurred, before the house has been disinfected?

A.—The Public Health Act, 1875, section 128 says: "Any person who knowingly lets for hire any house or room, in which any person has suffered from an infectious disease, is liable to a fine not exceeding £20, unless previously disinfected."

16 Q.—Is a person liable to a penalty for making a false statement as to infectious disease having recently occurred in a house or room?

A.—Yes; section 129 of the Public Health Act, 1875, says: "Any person letting or offering for hire any house, or part of a house, who, on being questioned as to the fact of there being (or within six weeks previously having been) therein any person suffering from any dangerous infectious disorder, knowingly makes a false answer to such question, becomes liable to a penalty or imprisonment."

17 Q.—Is a person liable to a penalty who ceases to occupy a house, without previously disinfecting it, or giving notice to the owner that it required disinfecting, after a case of infectious disease?

A.—Yes; if the Infectious Diseases Prevention Act, 1890, has been adopted, as section 7 says: "Every person on ceasing to occupy a house or room in which infectious disease has been known to exist within six weeks without having it disinfected or informing the owner or master, or who makes a false declaration as to the fact, shall be liable to a penalty not exceeding £20, or, to imprisonment not exceeding one month with, or without, hard labour."

18 Q.—Give a brief summary of the Cholera Regulations according to the order of the Local Government Board of August 28th, 1890.

A.—Every port Sanitary Authority, or other Sanitary Authority, within whose district persons are likely to be landed from ships "coming foreign," must appoint a place for mooring ships infected with cholera, and make provision for the reception of cholera patients and of persons suffering from illness which is suspected to be cholera. A ship infected with cholera must hoist a yellow flag when within three miles of the coast of England and Wales. When the customs officer finds on boarding a vessel, that there has been a case of cholera on board, he must detain the ship, order the master to anchor in a specified place, and forthwith give notice to the Sanitary Authority of the place at which the ship is about to call. If the Medical Officer of Health has reason to believe that the ship is infected with cholera, he must forthwith visit and examine the ship, and he may do so if the ship comes from a place infected with cholera. If he finds that there has been a case on board, he must certify the same to the master, who must moor in the place appointed. The Medical Officer of Health then examines all on board, and all found suffering from cholera may be either detained on the ship

or in some place provided by the Sanitary Authority if their condition permit of it, and must not leave until the Medical Officer of Health certifies that they are free from the disease. If they cannot be removed the ship remains subject to the control of the Medical Officer of Health, without whose written consent the infected persons cannot leave the ship. Persons certified by the Medical Officer of Health to be suffering from an illness which he suspects may prove to be cholera may be detained either on ship or in some place provided by the Sanitary Authority, for not more than two days, to ascertain whether it is cholera or not. No person to land (unless certified) unless he satisfies the Medical Officer of Health as to his name, place of destination, and address at such; the Medical Officer of Health gives names, &c., to the clerk to the Sanitary Authority who forwards them to the Sanitary Authority of the districts in question. The Medical Officer of Health gives such directions, and takes such steps as appear to him to be necessary, for preventing the spread of infection, and the master of the ship must carry out such directions as are given to him. In the event of a death from cholera on board, the master must, as directed by the Sanitary Authority, either bury the body at sea, properly weighted, or deliver it to the Sanitary Authority for interment. He must destroy all articles soiled with cholera discharges, and disinfect, and, if necessary, destroy the clothing, bedding, and other articles of personal use likely to retain infection, and disinfect the ship. If the vessel is not infected with cholera, but has passengers on board who are in a filthy or otherwise unwholesome condition, the Medical Officer of Health may certify to the master that it is desirable, with a view to prevent the introduction of cholera, that all persons leaving the ship must satisfy him as to their names and addresses, and the same measures are to be taken as in the case of persons permitted to leave an infected ship.

19 Q.—State how the Cholera Regulations Order of August 1890 has been amended by the order of August 1892?

A.—It forbids the landing of any "rags, bedding, disused or filthy clothing, whether belonging to emigrants or otherwise, from any foreign port in Europe, north of Dunkirk, other than ports of Norway, Sweden, and Denmark."

Note.—This order has been so modified by the order issued January 11th, 1893, as to allow exemption in case of rags duly certified not to have come from any places in which cholera

had been prevalent. It was not rescinded by the Order dated August 5, 1893, which substituted other regulations as to dirty bedding, &c., not being landed except for the purpose of disinfection or destruction, and the countries are specified in the order.

20 Q.—State what diseases in your opinion should be considered infectious in addition to those given in Section 6 of the Infectious Diseases Notification Act, 1889?

A.—Consumption, measles, chicken-pox, whooping-cough and influenza, all of which are highly infectious.

21 Q.—Give a specimen of the weekly or monthly report suitable for returns after a case of infectious disease.

A.— Borough of
Disinfecting-station.

A return of the houses, articles of bedding and clothing disinfected, and infectious diseases, for the ending
190

Situation of premises disinfected.	Date of disinfection.	Disinfection carried out.		Disease.	Date when patient was removed to hospital.
		No. of articles.	No. of rooms.		

22 Q.—Give suitable headings for a page in an Infectious Diseases Register.

A.—Inquiry forms should be used by the Inspector of Nuisances visiting the case so that from the information he obtains and that sent in to the Medical Officer of Health the following particulars can be entered in a suitable register.

Infectious Diseases Register. Borough of

No. of case. Date of medical certificate. Date when medical certificate was received. Name of patient. Age. Sex. Address. Disease. Date of onset. Source of infection (if ascertained). Milk-supply. Sanitary defects. Where case is isolated (home or hospital). School attended by patient or by other children in the same house. If

CENTRAL RESERVE

vaccinated (in case of small-pox). Date of disinfection. No. of rooms cleansed. No. of rooms fumigated. No. of articles disinfected. Name of medical practitioner reporting the case. Remarks.

Note.—The above are simply headings to the columns in the register.

23 Q.—What powers have Urban Authorities with respect to (*a*) hospital accommodation; (*b*) formation of a joint hospital?

A.—(*a*) Section 131 of the Public Health Act, 1875, gives power to Local Authorities to provide district hospitals or temporary place for the reception of sick, for which purpose they may themselves build such hospitals, enter into an agreement with any person for the use of hospital, or contract for a hospital building.

(*b*) The same section provides for two or more local authorities combining in providing a joint or common hospital.

24 Q.—Do the provisions of the Public Health Act, 1875, and of the Infectious Diseases Acts apply to ships?

A.—Yes; section 110 of the Public Health Act, 1875, provides that: For the purpose of this Act any vessel (not belonging to H.M. Government) lying in waters within a sanitary district shall be deemed to be a house, and its master the occupier. When the ship is in water which is not within the district of any Sanitary Authority, it shall be deemed to be in that of the nearest. This section brings ships under the scope of the Public Health Act, 1875, for nuisances only; but the Public Health (Ships) Act of 1875 extended its scope to include also sections 120, 121, 124, 125, 126, 128, 131, 132, and 133, thus including infectious diseases and hospitals. The Infectious Diseases Notification Act, 1889, and the Infectious Diseases Prevention Act, 1890, apply only after adoption in any district; when adopted, they apply to ships the same as to houses.

LESSON X

FACTORY AND WORKSHOPS ACT, HOUSING OF THE WORKING CLASSES ACT, AND THE SHOP HOURS ACT

1 Q.—Define broadly the difference between a factory and a workshop.

A.—The primary distinction between them appears to be that in a factory steam or some other mechanical power is used in aid of the manufacturing processes, and in workshops manual labour only is used.

In Part I of Schedule VI. of the Factory and Workshops Act, 1901, many other places are given as factories whether mechanical power is used or not, as print works, bleaching and dyeing works, earthenware works, lucifer match works, percussion-cap works, cartridge works, paper-staining works, fustian-cutting works, blast furnaces, copper mills, iron mills, foundries, metal and india-rubber works, paper mills, glass works, tobacco factories, letterpress printing works, book-binding works, flax scutch mills and electrical stations.

2 Q.—What powers have Sanitary Authorities in regard to (*a*) factories, (*b*) workshops?

A.—(*a*) Factories are under the factory inspectors, but in districts where Part 3 of the Public Health Amendment Act, 1890, is in force, every building used as a workshop or manufactory, or where persons are employed, or intended to be employed, in any trade or business, must be provided with sufficient and suitable accommodation in the way of sanitary conveniences (section 22). The surveyor reports to the Sanitary Authority, and they may serve a notice on the owner or occupier to provide same. Also, if more than forty persons are employed, the Sanitary Authority may enforce means of escape in case of fire.

(*b*) The Sanitary Authority and their officers shall, without prejudice to their other powers, have all such powers of entry, inspection, taking legal proceedings or otherwise as an inspector under this Act (Factory Inspector). This is for workshops and workplaces. (Section 125 of Factory and Workshops Act, 1901.)

3 Q. Are District Councils required to keep a register of the workshops in their districts? Also suggest a form for such a register.

A.—(*a*) Every District Council shall keep a register of all workshops situate within their district.

(*b*) See Answer (*b*) to Question 23, Lesson 7.

4 Q.—Explain the duty of a Sanitary Inspector with reference to sanitary accommodation in factories and workshops.

A.—In districts where Section 22 of the Public Health (Amendment) Act, 1890, is in force the Council may serve notice on the owner or occupier of a workshop or manufactory, requiring him to provide sufficient and suitable sanitary accommodation on a report from their surveyor that this requirement is not observed. And in districts where this Act is not in force the Council may deal with this matter under Section 38 of the Public Health Act, 1875, subject to the observance of any order made by the Secretary of State under Section 9 of the Factory and Workshops Act, 1901. In the first case the Sanitary Inspector has no duties except he be required to report to the Council or surveyor should he somehow discover that there is not sufficient or suitable sanitary accommodation. In the latter case he must report to the Sanitary Authority.

5 Q.—Mention briefly the duties of a District Council in regard to workshops and workplaces.

A.—The District Council is made responsible for the sanitary condition of the workshops and workplaces in their district, and "Sanitary Conditions" include (*a*) cleanliness, (*b*) air-space, (*c*) ventilation, and (*d*) drainage of the floors. For these purposes the provisions of section 91 of the Public Health Act, 1875, apply to all workshops and workplaces and are supplemented by certain additional provisions in the Factory Act

6 Q.—State the law with regard to cleanliness in workshops and workplaces.

A.—Section 2 of the Factory and Workshops Act, 1901, says: Every workshop and workplace must be kept in a cleanly state and free from effluvia; and if not so kept they may be dealt with under section 91 of the Public Health Act, 1875. Also, if the Medical Officer of Health or Inspector of Nuisances certifies that it is necessary for the health of the persons employed that a workshop, or any part of a workshop, should be limewashed, cleansed or purified, the District Council may give notice to the owner or occupier to do the work in a time specified in the notice: in default he will be liable to a penalty of 10*s.* per day during which default continues, and the Council may do the work and recover the cost in a summary manner.

7 Q.—State the law with regard to air-space in workshops and workplaces.

A.—Sections 2 and 3 of the Act provide that workshops and workplaces must not be overcrowded while work is carried on so as to be dangerous or injurious to the health of the persons employed, and a workshop or workplace which is overcrowded may be dealt with as a nuisance under section 91 of the Public Health Act, 1875.

Note.—A workshop is deemed to be overcrowded if less than 250 cubic feet of air space (or during overtime 400) is allowed for each person in the room, and the Act requires a notice to be affixed in the workshop stating the number of persons who may be employed in each room of the workshop.

8 Q.—What is stated in the Act with regard to ventilation in workshops and workplaces?

A.—Sections 2 and 7 of the Act deal with ventilation and provide that "Every workshop and workplace must be ventilated in such a manner as to render harmless, as far as practicable, any gases, vapours, dust, or other impurities generated in the course of the work that are a nuisance or injurious to health. Any workshop or workplace not so ventilated may be dealt with as a nuisance under section 91 of the Public Health Act, 1875. This general provision is supplemented in the case of workshops by a special requirement in the 1901 Act, that in every room in a workshop sufficient means of ventilation must be provided and sufficient

ventilation maintained; and where a standard of ventilation has been prescribed by the Secretary of State (as he has now power to do) for any class of workshops, that standard must be observed. Workshops where men only are employed are excluded from this requirement. Any workshop where this requirement is contravened may be dealt with as a nuisance.

9 Q.—What is stated in the Factory and Workshops Act, 1901, with reference to the drainage of floors of workshops?

A.—Section 8 of the Act requires that in every workshop, or part of a workshop, in which any process is carried on, which renders the floor liable to be wet to such an extent that the wet is capable of being removed by drainage, adequate means shall be provided for draining off the wet. A workshop not so drained may be dealt with as a nuisance under section 91 of the Public Health Act, 1875. This provision, however, does not apply to workshops in which men only are employed.

10 Q.—Does the Factory and Workshops Act, 1901, repeal all previous Factory Acts?

A.—All except sections 8, 9, 10, 12 and the First Schedule of the 1891 Act; also section 12, subsection 3 of section 24, and section 28 of the 1896 Act; but all these can be repealed from a date to be fixed by order of the Secretary of State.

11 Q.—Do bakehouses come under the control of the District Councils? If so, what powers have they in regard to the same?

A.—Bakehouses are either factories or workshops within the meaning of the Act, according as mechanical power is, or is not, used in aid of the processes carried on. They are therefore subject to the general provisions of the Act, and the same powers will be exercised by District Councils in regard to bakehouses that are exercised by them in regard to factories and workshops. A general power is also given (by section 98) to the Council in the case of any bakehouse which is in such a state as to be on sanitary grounds unfit for use or occupation as a bakehouse, to bring the case before a court of summary jurisdiction; and the court may thereupon impose a fine and order means to be adopted to remove grounds of complaint.

In addition to the general regulations of the Act special sanitary regulations for bakehouses are contained in the Act.

12 Q.—Give the substance of the special sanitary regulations for bakehouses contained in the Factory and Workshops Act 1901.

A.—Section 97 requires that: A bakehouse must not contain, or communicate directly, with, a water-closet, earth-closet, privy, or ashpit; a cistern supplying water to a bakehouse must be separate from any cistern supplying water to a water-closet; and a sewage pipe or drain must not have any opening in the bakehouse. Section 99 requires: All inside walls and ceilings of rooms and all passages and staircases to be limewashed every six months; or coated with three coats of paint (or varnish) every seven years, and washed with hot water and soap every six months. Section 100 requires that: Places on the same level with a bakehouse and forming part of the same building must not be used as sleeping-places, unless effectually separated from the bakehouse by a partition from floor to ceiling, and provided with an external glazed window of at least 9 square feet in area, of which $4\frac{1}{2}$ feet must be made to open for ventilation.

13 Q.—Have District Councils any powers for controlling the conditions under which work is done in the homes of the workers?

A.—Yes; important powers of controlling the conditions under which certain classes of work are done in the homes of the workers are given for the first time to the District Councils by the 1901 Act. These powers aim at the prevention of home work being done; (1) in dwellings which are injurious or dangerous to the health of the workers themselves, *e.g.*, through overcrowding, want of ventilation, or other insanitary conditions; (2) in premises where there is dangerous infectious disease.

14 Q.—What does the Factory and Workshops Act, 1901, say about underground bakehouses?

A.—The Act provides generally that no underground bakehouses (whether factory or workshop) shall be used as such unless it was so used on August 17th, 1901; and after January 1904, it shall not be lawful to use any underground bakehouse (whenever established) unless the Council are satisfied that

it is suitable for the purpose, in regard to construction, light, ventilation, and in all other respects, and have given a certificate of suitability.

15 Q.—Define the term "Underground Bakehouses."

A.—Section 101 of the Factory and Workshops Act, 1901, defines an underground bakehouse as a bakehouse in which the baking-room, or any room used for any process incidental thereto, is so situated that the surface of the floor is more than 3 feet below the surface of the footway of the adjoining street, or of the ground adjoining or nearest to the room.

16 Q.—How is a District Council to be kept informed of the places where home work is being carried on? Give a form for a page in the register for such places.

A.—(*a*) Occupiers of factories, workshops, or any place from which work is given out, and contractors employed by such occupiers, are required, in regard to such classes of work as may be fixed by the Secretary of State, to keep lists showing the names and addresses of all persons employed by them, either as workmen or as contractors outside such factory, workshop or place, and the place where they are employed, and to send to the Council twice a year (viz., on or before February 1st and August 1st) copies of such lists. The form in which such list is to be kept is prescribed by the Secretary of State in his Home Work Order of December 11th, 1901; these forms may be obtained from the Government printers.

(*b*)

OUTWORKERS AND CONTRACTORS REGISTER.

BOROUGH OF ———

No.	Name and address of outworker.	Name and address of employer.	Situation of premises where business is carried on.	Nature of business.	Remarks.

17 Q.—Does the Housing of the Working Classes Act, 1890, repeal all previous similar Acts? Also name the parts of

this Act and state which apply to urban, which to rural districts, and which to both.

A.—(*a*) All, except sections 3, 7, 8, and 9 of the Housing of the Working Classes Act of 1885.

(*b*) Part 1 deals with unhealthy areas, and applies only to Urban Authorities.

Part 2 deals with unhealthy dwelling-houses, and applies to both Urban and Rural Sanitary Authorities.

Part 3 deals with working-classes lodging-houses, and applies to both Urban and Rural Authorities, but requires adoption.

Part 4 deals with limits of area, conditions of letting houses, compensation to tenants for expulsion, or removal, &c.: this part is supplemental.

Part 5, Application of the Act to Scotland.

Part 6, Application of the Act to Ireland.

Part 7 repeals similar Acts, and contains temporary pro visions.

18 Q.—State what powers an Urban Sanitary Authority have for effecting the general sanitary improvement of their district.

A.—They have power under Part 1 of the Housing of the Working Classes Act, 1890, to deal with unhealthy areas, and for that purpose they shall consider an official representation that any houses, streets, &c., within a certain area are unfit for human habitation, or that their sanitary conditions, want of air or light or other defects, are such as to be "injurious to the health of the inhabitants of these or of other houses," and cannot be remedied except by the "rearrangement or reconstruction of the houses," and "if satisfied as to the truth thereof" and "of the sufficiency of their resources," shall forthwith make a scheme for the improvement of such area or areas.

19 Q.—Define the terms "official representation," "obstructive building," "street," and "lodging-houses for the working classes," as used in the Houses of the Working Classes Act, 1890.

A.—"Official Representation" is the report of the Medical Officer of Health that he must make when he finds that in a certain area there are only (*a*) houses and courts unfit for habitation, and (*b*) defects of ventilation, houses too closely grouped; and, further, that nothing short of an improvement scheme will remedy this condition. "Obstructive

building" is a building, though not in itself unfit for habitation or dangerous to health, (*a*) rendering others so by stopping access of light or air or otherwise, or (*b*) preventing the removal of such defects therein. "Street" includes any court, alley, street, square, or row of houses. "Lodging-houses for the working classes" includes separate houses for the working classes, whether containing one or several tenements; and "Cottages" includes gardens belonging thereto not exceeding half an acre in extent, or £3 in annual value.

20 Q.—If any dwelling-house appears to the Local Authority to be unfit for human habitation, what steps should be taken with a view to closing the premises?

A.—Section 32 of the Housing of the Working Classes Act 1890 says: It shall be the duty of every Local Authority to inspect their district from time to time (or cause it to be inspected); and, if any house is found unfit for human habitation, forthwith to proceed against the owner or occupier for its closure, whether it be occupied or not; the Court may impose a penalty not exceeding £20 and make a closing order; and, the closing order having been made, the Local Authority shall serve on every occupier, or tenant, notice to quit within a period of not less than seven days; in default they shall be liable to a daily penalty not exceeding £1.

21 Q.—Under what circumstances can a Local Authority demolish premises?

A.—If the closing order is not complied with, and the premises not remedied, the Local Authority may pass a resolution that it is necessary to demolish the building or buildings, and notice shall be served on the owner to that effect; they shall still further consider it and forward copies of the report and resolution to the owner, appointing a time and place for hearing his objections; after which they shall either allow his objections, or make an order for demolition, subject to appeal.

22 Q.—What is the condition to be implied on letting houses for the working classes? Are the Local Authority, in carrying out an improvement scheme, bound to provide other accommodation for any of the working-class population displaced?

A.—(*a*) Section 75 of the Housing of the Working Classes Act, 1890, says: In any contract made after August 14,

1885, for letting a house, or part of a house, for habitation by persons of the working classes, it shall be an implied condition that such house is then in all respects reasonably fit for human habitation.

(*b*) In London, yes; in the provinces, only when obligations are imposed by the confirming authority (Local Government Board).

23 Q.—Name the object and briefly outline the main provisions of the Shop Hours Act, 1892.

A.—The object is to limit the number of hours which a young person shall be employed, in or about any shop, to 74 hours in one week including meal times. And a notice to this effect shall be kept exhibited in a conspicuous place.

Note.—No penalty was provided for, in default, so a short Act of two sections only, called the Shop Hours Act, 1895, had to be passed, stating that the penalty was a sum not exceeding £2.

24 Q.—Does the Shop Hours Act, 1892, apply to all shops? Define the term "shop" and "young person," and state how Inspectors under this Act are appointed.

A.—(*a*) Yes (unless the context requires otherwise).

(*b*) "Shop" means retail and wholesale shops, markets, stalls, and warehouses in which assistants are employed for hire, and includes public houses and refreshment houses of any kind. "Young person" means a person under the age of eighteen years.

(*c*) The Council of any county or borough may appoint such Inspectors as they think necessary for the execution of this Act in their district, and sections 68 and 70 of the Factories and Workshops Act, 1878, shall apply in the case of any such officer, as if he were appointed under that Act.

LESSON XI

THE SALE OF FOOD AND DRUGS ACTS, 1875-1899, AND THE MARGARINE ACT, 1887.

1 Q.—What is the object of the Sale of Food and Drugs Act, 1875, and also state why the amending Act of 1879 was passed?

A.—(*a*) The object of this Act is to forbid any person to mix colour, stain or powder, or cause or permit so to mix, &c., any article of food so as to render it injurious to health, with intent that it shall be sold in that state; or to sell such article of food, under a penalty not exceeding £50 for a first offence, and, on a subsequent conviction of imprisonment with hard labour for a period not exceeding six months. Section 3 and section 6 provide that no person shall sell any food or drug which is not of the nature, substance, and quality demanded, under a penalty not exceeding £20, except when the addition so made is not intended fraudulently to increase its bulk, weight, &c., or to conceal its inferior quality. The Act also provides for the Local Authority appointing Inspectors to take samples of food and drugs, and an analyst to analyse the samples, with a view to taking proceedings and obtaining the conviction of the offenders.

(*b*) The 1879 Act was passed to settle or explain certain sections that were not sufficiently explicit in the 1875 Act; as, that it shall be no defence to allege that the purchaser, having bought for analysis only, was therefore not prejudiced by the sale. Also, that the article need not be deficient in all three respects (nature, substance, and quality); any one is sufficient. Also, that a sample of milk may be taken "at the place of delivery," *i.e.*, in the street or railway station as well as in the shop. It also provides that the minimum strength of brandy, whisky, and rum, be twenty-five

degrees under proof, and of gin thirty-five degrees under proof.

2 Q.—Define "food" and "drug" according to the Sale of Food and Drugs Acts.

A.—The definition of the word "food" in the 1875 Act is repealed, and is now defined by section 26 of the Sale of Food and Drugs Act, 1899, as follows: "Food shall include every article used for food or drink by man, other than drugs and water, as well as any article which ordinarily enters into, or, is used in, the composition or preparation of human food; and shall also include flavouring matters and condiments."

"Drug" is defined as including medicines for external, as well as internal use.

3 Q.—Give the nature of the four saving clauses specified in Section 6 of the 1875 Act.

A.—(1) Non-injurious substance added, required for its preparation as an article of commerce, and not fraudulently to increase its weight, bulk, &c.; or, (2) it is a proprietary medicine; the subject of a patent, or corresponds with the specification; or (3) is "compounded" as herein mentioned; or (4) when the extraneous material is an unavoidable admixture in the process of collection or preparation.

4 Q.—Who may obtain samples of foods and drugs for analysis? In purchasing samples for analysis may an assistant act?

A.—(*a*) The Medical Officer of Health, Inspector, constable or Inspector of Weights and Measures charged with the execution of this Act.

Note.—This means that a special appointment is necessary to take samples, and that the Inspector should carry upon him a copy of the resolution of the authority appointing him under their seal.

(*b*) Yes, any person over fourteen years of age may ask for the sample, but the Inspector should be at hand, take the sample, pay for same, and offer to divide, &c., as per the following answer.

5 Q.—State clearly what must be done by the purchaser of any food or drug obtained for analysis.

A.—Section 14 of the Sale of Food and Drugs Act, 1875, says that: "The purchaser, after completing the purchase, must inform the seller of his intention to have the sample analysed

by the public analyst, and at once (offer to) divide it into three parts, to be then and there separated, each part to be marked and sealed or fastened up, and shall, if required to do so (proceed accordingly and shall), deliver one of the parts to the seller, retain one himself, and deliver or forward the third part to the public analyst.

Note.—Section 13 of the Sale of Food and Drugs Act, 1899, repeals the words in brackets above, viz.: "offer to" and "proceed accordingly and shall."

6 Q.—Suppose the seller refuses the offer of the inspector to divide the sample in his presence, or to accept one part of the sample, what is then the duty of the Inspector?

A.—Section 15 of the 1875 Act which provided for this, by allowing the Inspector in such a case to forward the whole sample to the public analyst, for him to divide it into two parts and let the Inspector have one part (for future reference, if necessary) is now repealed by the 1899 Act, so that the Inspector *must* divide it into three parts, and leave one with the seller (*see also* the previous answer).

7 Q.—Can an Inspector send samples by post to the public analyst, and, is there a distance limit?

A.—(*a*) and (*b*) Yes; section 16 of the Act says: "If the analyst resides beyond two miles, the sample may be sent by post as a registered letter or parcel."

Note.—The 1899 Act, section 15, repeals the words "Registered Letter," and substitutes the words "Registered Parcel."

8 Q.—Is there any limit of time fixed in which action against any person under the Sale of Food and Drugs Act can be taken?

A.—Yes; section 19 of the Sale of Food and Drugs Act, 1899, provides that when any article of food or drug has been purchased from any person for test purposes, any prosecution under the Sale of Food and Drugs Act in respect of the sale thereof, notwithstanding anything contained in section 20 of the Sale of Food and Drugs Act, 1875, shall not be instituted after the expiration of twenty-eight days from the time of the purchase. And—in any prosecution under the Sale of Food and Drugs Acts, the summons shall state particulars of the offence, or offences, alleged, also the name

of the prosecutor, and shall not be made returnable in less time than fourteen days from the day on which it is served, and there must be served therewith a copy of the analyst's certificate obtained on behalf of the prosecutor.

9 Q.—Is the Inspector entitled to obtain milk in course of delivery, and is it necessary in such a case for the officer to divide the sample into three parts?

A.—(*a*) Yes; see answer to No. 1 question in this lesson (section 3 of the 1879 Act).

(*b*) No; it is not necessary for him to divide the sample into three parts. Before the 1899 Act was passed the Inspector was required to seal it up and deliver or forward it whole to the analyst, but by section 10 of the 1899 Act, if the name and address of the consignor appears on the can, he shall forward a portion of the sample by registered parcel, or otherwise, to him. This in my opinion applies when the sample is taken in the railway station, &c., and there is no one in charge of the milk; but if the same is taken in the street from a farmer or dairyman delivering same, the sample should be divided into three parts, as is usual with other samples.

10 Q.—Is it compulsory to have name and address inscribed on the cart or can when selling milk in a public place?

A.—Yes; section 9 of the 1899 Act says: "Every person who, himself or by his servant, in any highway or place of public resort, sells milk or cream from a vehicle, or from a can or other receptacle, shall have conspicuously inscribed on the vehicle or receptacle his name and address, and in default shall be liable on summary conviction to a fine not exceeding £2."

11 Q.—Under what Act and section should action be taken against any one for selling skimmed milk for pure milk?

A.—Section 9 of the Sale of Food and Drugs Act, 1875. In this section it is forbidden to sell any article from which some part has been abstracted, without notice to the buyer.

12 Q.—As Inspector under the Sale of Food and Drugs Act, you are well known to the local tradesmen. State the pre-

cautions you would take in collecting samples to prevent the vendors being on their guard.

A.—See answer to No. 4 question; employ an assistant, anyone over fourteen years of age; but the Inspector must be at hand to take and pay for the sample (although it is quite as legal, I believe, and often done, to allow the assistant to pay for it) and must take it from him (or her) before he (or she) leave the shop, inform the seller that it is to be analysed, and divide it, &c., as per answer No. 5.

13 Q.—A milk-seller in a town receives all his milk by rail from a farmer in the country. Explain clearly what steps the Inspector of Nuisances can take, in order to determine whether the milk is adulterated; and, if adulterated, who is responsible?

A.—(*a*) The Inspector of Nuisances, as such, has no power, but if he happens to hold the appointment of Food and Drugs Inspector he may take a sample of milk from the cans in the railway station as soon as they arrive. He must demand the sample from the railway official in charge, and have him (if possible) as a useful witness in case of a prosecution. The milk should be well mixed before taking a sample, to distribute the cream throughout.

(*b*) If the milk is found adulterated, and the dealer has no warranty from the farmer, he is responsible; but if he has a warranty from the farmer, the latter is responsible.

14 Q.—Is it an offence to refuse to sell an article required by an Inspector for analysis?

A.—Yes; section 4 of the 1879 Act provides for a penalty not exceeding £10 for refusing to sell.

15 Q.—Under what sections of the Sale of Food and Drugs Act should an Inspector proceed in the cases of adulteration (*a*) alum in bread; (*b*) spirits of nitre diluted with water (*c*) whisky thirty-five degrees under proof?

A.—(*a*) Section 6 of the 1875 Act, or if there is much alum in the bread, action could be taken under section 3 of the 1875 Act, as it could be proved to be injurious to health.

(*b*) Section 6 of the 1875 Act also covers this, as it would be not of the nature, substance, and quality demanded.

(*c*) Section 6 of the 1879 Act provides for this, as whisky, rum and brandy must not be more than twenty-five, and

gin thirty-five degrees under proof. (*See* answer to question No. 1.)

16 Q.—What is the penalty for wilfully obstructing or impeding an Inspector in, or attempting to prevent him by bribe or promise from, carrying out his duty under the Sale of Food and Drugs Acts?

A.—Section 16 of the 1899 Act says: "Any person who wilfully obstructs or impedes any Inspector, or other officer, in the course of his duties under the Sale of Food and Drugs Acts; or, by any gratuity, bribe, promise or other inducement, prevents, or attempts to prevent, the due execution by such Inspector, or other officer, of his duty under those Acts, shall be liable, on summary conviction, for the first offence to a fine not exceeding £20, for the second offence to a fine not exceeding £50, and for any subsequent offence to a fine not exceding £100.

17 Q.—What is stated regarding tinned, skimmed or separated milk?

A.—Section 11 of the 1899 Act says: "Every tin or other receptacle, containing condensed, separated or skimmed milk, must bear a label, clearly visible to the purchaser, on which the words 'Machine-skimmed Milk,' or 'Skimmed Milk' as the case may require, are printed in large and legible type, and if any person sells or exposes, or offers for sale, condensed, separated or skimmed, milk, in contravention of this section, he shall be liable on summary conviction to a fine not exceeding £10.

18 Q.—Define "Butter," "Margarine," "Cheese," and "Margarine Cheese," under the Margarine Act of 1887 and the Sale of Food and Drugs Act, 1899.

A.—"Butter" is the substance usually known as butter, made exclusively from milk or cream, or both, with, or without, salt, or other preservative, and with, or without, the addition of colouring-matter. "Margarine" includes all substances, whether compounds or otherwise, prepared in imitation of butter, and whether mixed with butter or not; these two are defined by the Margarine Act, 1887. "Cheese" is defined by the Sale of Food and Drugs Act as the substance usually known as cheese, containing no fat derived otherwise than from milk. "Margarine Cheese" is defined

by the same Act, as any substance, whether compound or otherwise, which is prepared in imitation of cheese, and which contains fat not derived from milk.

19 Q.—What does the Margarine Act of 1887 specify respecting the marking or labelling of packages of margarine? and does the Sale of Food and Drugs Act, 1899, extend the Margarine Act?

A.—(*a*) By the former Act, every package, whether open or closed, containing margarine, shall be branded, or durably marked "Margarine" on the top, bottom and sides in printed capital letters not less than $\frac{3}{4}$ of an inch square, and, if exposed for sale by retail, each parcel shall have attached a label marked in printed capital letters "Margarine," in $1\frac{1}{2}$-inch square letters, and, when selling it, the wrapper shall be marked "Margarine" in quarter-inch square letters.

(*b*) Yes; by the 1899 Act the above provisions as to marking, &c., shall apply to margarine-cheese also. This Act also amends the former Act, by requiring the package to be marked or branded, on the package itself, and not solely on a label, ticket, or other thing attached thereto. Also the letters required to be printed on the paper wrapper in which margarine or margarine-cheese is sold must be (capital block letters) not less than $\frac{1}{2}$ an inch long, distinctly legible, and no other printed matter shall appear on the wrapper.

20 Q.—What would be a good defence for any one charged with selling margarine for butter? Also, has the 1899 Act amended the sections in the Sale of Food and Drugs Act, 1875, and the Margarine Act, as to a warranty or invoice being available for defence in any proceedings under these Acts?

A.—(*a*) There is a saving clause in the Margarine Act, 1887, also in the Sale of Food and Drugs Act, 1875, namely: that the vendor be absolved if he proves that he bought the article with a written warranty, and sold it in the same state as when he bought it, believing it to be butter, &c.

(*b*) Yes; section 20 of the 1899 Act says: "A warranty or invoice shall not be available as a defence to any proceeding under the Sale of Food and Drugs Acts, unless the defendant has, within seven days after service of the summons, sent to the purchaser a copy of such warranty or invoice, with a written notice stating that he intends to rely

on the warranty or invoice, and specifying the name and address of the person from whom he received it, and has also sent a like notice of his intention to such person. The person by whom such warranty or invoice is alleged to have been given shall be entitled to appear at the hearing and to give evidence; the court may, if it thinks fit, adjourn the hearing to enable him to do so."

21 Q.—In taking a sample of butter for analysis, is the Inspector required to go through the form of purchase prescribed by the Sale of Food and Drugs Act, 1875?

A.—No; section 10 of the Margarine Act, 1887, says: "Officers authorised to take samples under the Sale of Food and Drugs Acts may take samples of butter (or substances purporting to be butter, exposed for sale, and not marked as Margarine) without going through the form of purchase required by that Act, but otherwise complying with its provisions as to dealing with the samples."

22 Q.—Is an occupier of a manufactory of margarine or margarine-cheese required to be registered? Give a copy of a label suitable to attach to samples of food or drugs.

A.—(*a*) Yes. All margarine factories are required to be registered with the Sanitary Authority by whom the analyst is appointed. The Margarine Act, 1887, and the Sale of Food and Drugs Act, 1889, extend this to cover margarine-cheese. This later Act also makes it compulsory for the occupiers of wholesale manufactories of margarine and margarine-cheese to keep a register, and it imposes a penalty not exceeding £10 for a first offence, and not exceeding £50 for a subsequent offence, for failing to (*a*) keep such a register; (*b*) refusing to produce such register when required by officer of Local Government Board; (*c*) failing to keep it up to date; (*d*) wilfully making a false entry in such register; (*e*) fraudulently omitting to enter any particular which ought to be entered in such register.

(*b*)

LABEL FOR FOOD AND DRUG SAMPLES.

BOROUGH OF ———

No. of sample
Description of article
Date of purchase

Inspector.

23 Q.—Make out a copy of the headings suitable for a page in the Register of Food and Drugs purchased; also a suitable one for the Inspector's pocket-book?

A.—(*a*)

REGISTER OF FOOD AND DRUGS PURCHASED.

BOROUGH OF ———

No.	Description of article.	Vendor's name and address.	Date of purchase.	Date when sample was delivered to analyst.	Result of analysis.	Action taken and result.

(*b*) Pocket-book used under the Sale of Food and Drugs Act.

Borough of

No of Sample — Date of Purchase

Name and Address of Vendor or Agent — Description of article purchased

Date delivered to Analyst — Quantity purchased

Price paid

(Inspector)

Remarks

24 Q.—Give suitable headings for a page in the "Register of Vendors," of whom Samples of Food and Drugs have been purchased?

A.

REGISTER OF VENDORS OF WHOM SAMPLES OF FOOD AND DRUGS HAVE BEEN PURCHASED.

BOROUGH OF ———

No.	Name and address of vendor.	Nature of sample and date when purchased.	Nature of sample and date when purchased.	Nature of sample and date when purchased.

LESSON XII

SALE OF HORSEFLESH, ETC., REGULATION ACT, 1889; RIVERS POLLUTION PREVENTION ACTS, 1876-1893; CANAL BOATS ACTS, 1877-1884; CONTAGIOUS DISEASES (ANIMALS) ACT, 1894: THE DAIRIES, COWSHEDS AND MILKSHOPS ORDER, WITH THE MODEL REGULATIONS OF THE LOCAL GOVERNMENT BOARD FOR SAME

1 Q.—What is the object of the Sale of Horseflesh, &c., Regulation Act, 1889? State where horseflesh may be legally sold, and what signs on such shops are necessary?

A.—(*a*) To prevent the sale of horseflesh, &c., except in places properly labelled for such, and to prevent the sale of horseflesh when other meat is asked for. It also gives power to the Medical Officer of Health, and the Inspector of Nuisances to inspect such places.

(*b*) The letters over the shop or stall where it is sold must be at least 4 inches long, to the effect that horseflesh is sold.

2 Q.—Define "Horseflesh" according to the Act, and also state whether it would be an offence to sell horseflesh as beef.

A.—(*a*) Horseflesh includes the flesh of asses and mules; and means horseflesh sold cooked or uncooked, alone or in combination with any other substance.

(*b*) Yes.

3 Q.—What is the object of the Rivers' Pollution Prevention Act, 1876? State briefly its chief provisions.

A.—(*a*) The object is to prevent pollution and the establishment of new sources of pollution.

(*b*) The chief provisions are: (Section 2) no solid refuse of any kind must be put into any stream so as to interfere with its due flow or to pollute its waters; (Section 3) no solid or liquid sewage matter must be passed into any stream; (Section 4) no poisonous, noxious, or polluting liquid from any factory or manufacturing process, must be passed into any stream; (Section 5) no solid matter from mines must be put into any stream, so as to prejudicially affect its flow; nor must any poisonous, noxious, or polluting solid or liquid matter from mines be passed into any stream, other than water in the same condition in which it has been raised or drained from such mines.

4 Q.—Name the chief saving clauses of Rivers' Pollution Prevention Act, 1876; and define the terms "Stream," "Solid matter," and "Polluting," as used therein.

A.—(*a*) In section 3, *re* "polluting by sewage matter," the following saving clause occurs: "but as regards conditions in existence prior to 1876, no offence is committed under this Act if it is shown, that the best practicable and available means are being used to render harmless the sewage entering the stream"; this saving clause is repeated in section 4 as to polluting liquid from factories.

(*b*) "Stream" includes the sea as far as the Local Government Board may determine. "Solid matter" does not include suspended particles. "Polluting" does not include innocuous discolouration.

5 Q. What is the object of the Rivers' Pollution Prevention Act, 1893? State briefly the provisions of section 1.

A.—A short Act was passed in 1893 to explain or remove a technical difficulty likely to be raised by Sanitary Authorities seeking to evade their responsibilities under section 3 of the 1876 Act; as by saying they did not know; section 1 of the 1893 Act says: "They shall be held to knowingly pass the sewage into a stream where it is permitted so to pass along their sewers or channels."

6 Q.—What other Acts deal with the polluting of streams, in addition to the Rivers' Pollution Prevention Acts of 1876 and 1893?

A.—Section 17 of the Public Health Act, 1875, provides for

Local Authorities purifying sewage before discharging it into any natural stream or watercourse, and section 68 provides against fouling of streams with gas-washings or other substances used in making or supplying gas. In the Public Health (Amendment) Act, 1890, section 47, it is forbidden to throw or place in any river or watercourse, any cinders, ashes, bricks, stones, dust, rubbish, filth, or other matters which are likely to cause annoyance.

Note.—This Act is adoptive.

7 Q.—What do the Canal Boat Acts, 1877 and 1884, state respecting the registration, lettering, marking, and numbering of canal boats?

A.—Section 1 of the 1877 Act says: "No canal boat shall be used as a dwelling unless it is registered, and then only by the number of persons of the age and sex for which it is registered." It must be registered by a Sanitary Authority whose district abuts upon the canal on which the boat is intended to ply, and which is also within a school district. Section 7 and section 1 of the 1884 Act, says: "Certificate of registration ceases to be of force, in the event of any structural alterations affecting conditions on which it was granted." Section 2 of the 1877 Act, directs the Local Government Board to make regulations for the registration, lettering, marking and numbering of canal boats, and section 3 says: Every registered boat must have painted upon it the registered number, the place to which it belongs, and the word "Registered"; and Section 6 of the 1884 Act adds that a boat must be lettered, marked and numbered in a conspicuous position on both sides, or on the stern, so as to be clearly seen from either bank.

8 Q.—State the purposes for which regulations have been made by the Local Government Board under section 2 of the Canal Boats Act, 1877.

A.—For fixing the number, age and sex of persons who may be allowed to occupy or dwell in a canal boat, having regard to cubic space, ventilation and general accommodation. For promoting cleanliness and habitable condition of such boats, and for preventing the spread of infectious disease. (Also *see* the last answer for lettering, marking, &c.)

9 Q.—What are the regulations respecting the cubic space

allowed for occupants of canal boats? Define the terms "canal," and "canal boats."

A.—(*a*) An after-cabin used as a dwelling must contain at least 180 cubic feet, and a fore-cabin at least 80 cubic feet, of air space.

(*b*) "Canal" includes all navigable rivers, tidal or otherwise, within the body of a county. "Canal boat" includes every vessel, however propelled, used for conveyance of goods along such waters, but does not include a ship registered under the Merchant Shipping Act, unless the Local Government Board orders otherwise.

10 Q.—Give a summary of the principal sanitary provisions contained in the regulations issued by the Local Government Board in 1878 for canal boats.

A.—The boat must have proper storage for 3 gallons of water. If intended to be used for foul cargoes, the hold must be separated from any inhabited cabin by a double bulkhead, with an interspace of 4 inches, and the bulkhead next the cargo must be watertight. A cabin in which a married couple sleep is not to be occupied at the same time by any other male over 14, or female over 12, years of age. Males above 14, and females above 12 years of age must not occupy the same cabin (except married couples). The interior of the cabin must be repainted every three years, and must be kept clean. Bilge water must be pumped out daily. The master of the boat must at once notify any case of infectious disease on board to the Sanitary Authority of the district through which the boat is passing, and also to the Sanitary Authority of the place of destination.

11 Q.—May an Inspector of Nuisances be requested by a Local Authority to act as their officer, under the Contagious Diseases (Animals) Act?

A.—Yes. (*See* the Local Government Board Order of March 23, 1891, clause 14, in answer to question 2, Lesson VII.)

12 Q.—Define "disease" according to the Contagious Diseases (Animals) Act.

A.—The expression "disease" means cattle-plague (or rinderpest), contagious pleuro-pneumonia of cattle, foot-and-mouth disease, sheep-pox, sheep-scab, or swine fever (that is to say the disease known as typhoid fever of swine, soldier, purples,

red-disease, hog-cholera or swine-plague). Glanders and farcy have also been added to the above by the glanders or farcy Order, 1894, by the Board of Agriculture.

13 Q.—Explain briefly the duties of an officer under the Contagious Diseases (Animals) Act, 1894.

A.—The Inspector of Nuisances should, as soon as he becomes acquainted with the fact, or has reason to suspect, that disease is existing or has existed within the last 56 days; or that the carcase of a diseased or suspected animal is, or has been, kept, or has been buried, destroyed, or otherwise disposed of, or that there is found any pen, place, vehicle, or thing, in respect whereof any person has, on any occasion, failed to comply with the provisions of this Act or an order of the Board of Agriculture or of a regulation of the Local Authority, and he shall have all the powers which a constable has under this Act or otherwise in the place where the Inspector is acting. That is, he may, without warrant, stop and detain any person seen, or found committing, or reasonably suspected of committing, an offence against this Act. If his name and address are not known to the Inspector, and he does not give them to the Inspector's satisfaction he may apprehend him; also he may stop and detain any animal, vehicle, boat, or thing and order the same to be taken back, to, or into, the district from which it came, and enforce or execute that requisition. He should report to the Medical Officer of Health and the Veterinary Inspector at once any place or animals infected with disease, and act under their instructions as to destroying any carcase, disinfecting, &c., and also report to the Sanitary Authority.

14 Q.—Define the terms "animals,'" "cattle," "carcase," "litter" and "fodder."

A.—"Animals" means, except where it is otherwise expressed, cattle, sheep, goats, and all other ruminating animals and swine. "Cattle" means bulls, cows, oxen, heifers and calves. "Carcase" means the carcase of an animal, and includes part of a carcase, and the meat, bones, hide, skin, hoofs, horns, offal, or other part of an animal, separately or otherwise, or any portion thereof. "Litter" means straw or other substance commonly used for bedding or otherwise for or about animals. "Fodder" means hay or other substances commonly used for food of animals.

15 Q.—To what extent does the Contagious Diseases (Animals) Act, 1894, repeal previous Acts?

A.—

Name of Act.	Extent of Repeal.
The C.D.A.A. 1878	The whole Act, except section 34.
The C.D.A.A. 1884	The whole Act.
The C.D.A. Transfer of Districts Act, 1884 . . .	Parts of The whole Act.
The C.D.A.A. 1886	The whole Act, except section 9.
The Board of Agriculture Act, 1889 .	Section 3.
The C.D.A. (Pleuro-Pneumonia) Act, 1890	The whole Act.
The C.D.A.A. 1892	The whole Act.
The C.D.A.A. 1893	The whole Act.

16 Q.—Is it necessary for all dairymen, cowkeepers, and sellers of milk to be registered?

A.—Yes, as section 6 of the Dairies, Cowsheds and Milkshops Order of 1885 says: "It shall not be lawful for any person to carry on in the district of any Local Authority the trade of cowkeeper, dairyman, or purveyor of milk unless he is registered as such therein, in accordance with this Article."

Note.—A person who sells milk from his own cows in small quantities to his workmen or neighbours for their accommodation need not be registered.

17 Q.—What provisions are contained in the Dairies, Cowsheds and Milkshops Order, 1885, to prevent contamination of milk by infectious disease?

A.—Section 9 of the Dairies, Cowsheds and Milkshops Order, 1885, says: "It shall not be lawful to allow any person suffering from a dangerous infectious disorder, or having recently been in contact with a person so suffering, to milk cows or to handle vessels used for containing milk for sale, or in any way to take part or assist in the conduct of the trade or business of cowkeeper, dairyman, purveyor of milk or occupier of a milk-store or milkshop, so far as regards the production, distribution or storage of milk; or, if himself so suffering, or having recently been in contact, as aforesaid, to milk cows, &c. &c., until, in each case, all danger therefrom of the communication of infection to, or contamination of, the milk has ceased."

18 Q.—Is it lawful for a cowkeeper to have swine in any cowshed, and does the Dairies, Cowsheds and Milkshops Order, 1885, contain any provision forbidding the milk from a diseased cow to be used for human consumption?

A.—(*a*) No. Section 12 says: "It shall not be lawful to keep any swine in any cowshed or other building used by him for keeping cows, or in any milkstore or other place used by him for keeping milk for sale."

(*b*) Yes. Section 16 says: "If at any time disease exists among the cattle in a dairy or cowshed, or other building or place, the milk of a diseased cow therein shall not be mixed with other milk, and shall not be sold or used for human food; and shall not be sold or used for food of swine or other animals, unless and until it has been boiled.

Note.—By Article 2 of the Dairies, Cowsheds and Milkshops Order of 1889 such disease of the udder as is certified by a veterinary surgeon to be tubercular is included as a disease for the purpose of section 16 of the 1885 Order (given above).

19 Q.—Give headings suitable for the register of cowsheds, dairies and milkshops.

A.—

REGISTER OF COWSHEDS, DAIRIES AND MILKSHOPS.

BOROUGH OF ———

No.	Date of registration.	Name of occupier.	Situation of premises registered.	Whether registered as cowkeeper, dairyman, or purveyor of milk.	Remarks.

20 Q.—Give a suitable page in the "Inspector's Pocket-Book" for cowsheds, dairies and milkshops.

A.—

INSPECTION-BOOK FOR COWSHEDS, DAIRIES AND MILKSHOPS.

BOROUGH OF ———

Date of inspection 190
Situation of premises inspected
Name of occupier
Name and address of owner or agent
Particulars of premises inspected:—
No. of cows kept
No. of cowsheds
No. of places used for storing milk
Dimensions and cubical contents of each cowshed:—

No. 1.	No. 3.	No. 5.
No. 2.	No. 4.	No. 6.

Average space per head of cattle
Remarks as to drainage
Remarks as to water-supply
Remarks as to ventilation, lighting, paving, &c., of the cowsheds
Superficial area of the windows (if any) in each of the cowsheds.
General remarks:—

21 Q.—Give the model regulations of the Local Government Board with respect to the inspection, lighting and ventilation of dairies, cowsheds and milkshops.

A.—(*a*) Every occupier of a dairy wherein any cattle may be kept, and every person for the time being having the care or control of any such dairy, or of any cattle therein, shall afford the Medical Officer of Health, Inspector of Nuisances, or officer, all reasonable assistance that may for the purpose of inspection be required of him.

Note.—Section 9 (4) of the Contagious Diseases (Animals) Act, 1886, gives the Local Authority and their officers the right of admission for the purpose of enforcing any order, &c.

(*b*) Every cowkeeper shall provide that every dairy and every cowshed in his occupation shall be sufficiently lighted with windows, whether in the sides or roof thereof.

(*c*) Every cowkeeper shall cause every dairy and every cowshed in his occupation to be sufficiently ventilated, and for this purpose to be provided with a sufficient number of openings into the external air to keep the air in the dairy or cowshed in a wholesome condition.

22 Q.—What is stated in the model regulations of the Local Government Board with respect to the cleansing and drainage of dairies, cowsheds and milkshops?

A.—(*a*) Every cowkeeper, and every occupier of a milkstore or milkshop, shall cause every cowshed and every part of the interior of every dairy, milkstore and milkshop in his occupation to be thoroughly cleansed from time to time, as often as may be necessary to secure that such cowshed or dairy shall be at all times reasonably clean and sweet, and to maintain such milkstore or milkshop in a thorough state of cleanliness.

(*b*) Every cowkeeper shall cause the drainage of every cowshed, and every dairy, in his occupation to be so arranged that all liquid matter which may fall or be cast upon the floor, may be conveyed by a suitable open channel to a drain inlet, situate in the open air, at a proper distance from any door or window of such cowshed or dairy (in the case of a dairy, the drain inlet must be a properly trapped gully). No inlet to be inside any cowshed, dairy, milkstore or milkshop.

23. Q.—What is the regulation of the Local Government Board regarding the water-supply of cowsheds and dairies; also, what is the amount of the penalty for the contravention of any regulation?

A.—(*a*) Every cowkeeper shall keep in, or in connection with, every cowshed in his occupation a supply of water suitable and sufficient for all such purposes as may from time to time be reasonably necessary. And every cowkeeper shall cause every dairy in his occupation to be provided with an adequate supply of good and wholesome water for the cleansing of such dairy, and of any vessels that may be used therein, for containing milk, and for all other reasonable and necessary purposes in connection with the use thereof. He shall cause such receptacle or cistern in which any such water may be stored to be emptied and thoroughly cleansed from time to time, as often as may be necessary to prevent the pollution of the water that may be stored therein; and such cistern

or other receptacle to be so placed as to be at all times readily accessible, and, if for storage only, properly covered and ventilated.

(*b*) Every person who offends against any of these regulations shall be liable to a penalty not exceeding £5, and if the offence is continued, not exceeding 40s. per day.

24 Q.—Give briefly the regulations of the Local Government Board with regard to the cleansing of milk vessels, and the precautions to be taken by purveyors of milk against infection and contamination.

A.—(*a*) Cowkeepers and purveyors of milk must thoroughly cleanse with steam or boiling water every vessel, receptacle or utensil used by him, and take all precautions to maintain all such vessels in a constant state of cleanliness.

(*b*) Every purveyor of milk must take proper precautions in connection with the storage and distribution of milk to prevent its exposure to any infection or contamination. Milk must not be kept in any room used as a kitchen or living room, or any room which communicates directly by a door, window or otherwise with a sleeping-room; or in any room or building where there may be an inlet to a drain; or in any room or place where it would be exposed to any impure air, or noxious, or offensive, or deleterious gas, or substance, &c. He must not keep any milk for sale in any vessel, &c., which is not thoroughly clean. The udder and teats of the cow to be thoroughly clean at the time of milking. The hands of the person milking also, to be thoroughly clean, and free from infection and contamination.

LESSON XIII

MODEL BYLAWS

1 Q.—What is a model bylaw; and what are the main points to be observed in the making and confirming of bylaws?

A.—(*a*) A model bylaw is a bylaw made by the Local Government Board for the guidance of Sanitary Authorities in making bylaws.

(*b*) When bylaws are made by a Local Authority, (1) they must be under the common seal of the Local Authority; (2) they must be reasonable; (3) they may be altered or repealed by a subsequent bylaw; (4) they must be confirmed by the Local Government Board, and (*a*) notice be given in local newspapers, or by handbills, or otherwise, for one month, and (*b*) provision made for supplying ratepapers with a copy (6d. per hundred words may be charged), (5) they must be printed and hung up in the office of the Local Authority, and accessible to ratepayers at reasonable times.

2 Q.—What is the difference between a bylaw and a regulation?

A.—A bylaw requires the approval or confirmation of the Local Government Board, but a regulation does not. Regulations are usually made under an Act of Parliament, such as the Public Health Act, 1875, or some local act. Regulations may also be made under the Dairies, Cowsheds and Milkshops Order, 1885.

3 Q.—What is recommended in the model bylaws respecting the constructing of a receptacle for dung, &c., in connection with premises for cattle, swine, &c., and what is the minimum distance swine should be kept from a dwelling-house?

A.—(*a*) Every occupier of premises wherein any horse or other beast of burden, cattle or swine, may be kept, shall

provide a suitable receptacle for dung, manure, soil, filth, or other offensive or noxious matter; and such receptacle shall be constructed so that the bottom or floor shall not be lower than the ground adjoining, shall be furnished with a suitable cover, and shall be kept covered; it should be provided with a drain to convey all liquid refuse to a sewer or cesspool; be constructed of such material as to prevent any escape or soakage therefrom; and be emptied at least once per week.

(*b*) There is no distance specified; the distance is left for each Sanitary Authority to state for themselves, of course, subject to the approval of the Local Government Board.

Note.—The Public Health Act, 1875, says, they must not be kept in a dwelling-house, or so as to be a nuisance.

4 Q.—What is given in the model bylaws as to the times of cleansing for earth-closets, privies, ashpits, and cesspools, and with respect to the removal of snow from footways?

A.—(*a*) Earth-closets with fixed receptacles and cesspools to be emptied once at least in every three months. Earth-closets with a movable receptacle, privies with either fixed or movable receptacles, and ashpits, whether used only as dust receptacles or in combination with a privy, once at least in every week.

(*b*) Occupiers of premises fronting, abutting or adjoining, on any street, shall as soon as snow has ceased to fall, clear the footway, and not cause accumulation in the channel or carriage way. No salt to be used, unless the slush resulting therefrom is immediately removed.

5 Q.—What is stated in the model bylaws as to noxious vapours arising from blood-boiling, &c., and the drainage of a fell-monger's premises?

A.—(*a*) Every blood-boiler shall adopt the best practicable means of rendering innoxious all vapour emitted, during the process of boiling, from the contents of any pan, &c. He shall, in every case, either cause the vapour to be discharged into the external air, in such a manner and at such a height, as to admit of its diffusion without noxious or injurious effects, or shall cause the vapour to pass over the fire, or into a suitable condensing apparatus, or both, so as effectually to consume the vapour, or to deprive the same of all noxious or injurious properties.

Note.—This bylaw also applies to the following offensive trades: blood-drier, bone-boiler, soap-boiler, tallow-melter,

fat-melter or fat-extractor, tripe-boiler, glue-maker and size-maker.

(*b*) Every fell-monger shall cause every drain, or means of drainage, upon or in connection with the premises where his trade is carried on, to be maintained at all times in good order and efficient action.

Note.—This bylaw applies to every offensive trade.

6 Q.—What is stated in the model bylaws as to the storage of bones on the premises of a bone-boiler; also as to the cleansing of the benches, floors and walls of the premises, and of the utensils used therein by a tripe-boiler?

A.—(*a*) Every bone-boiler shall store all bones, not immediately required for boiling, in such a manner and in such a situation as to prevent the emission of noxious or injurious effluvia therefrom.

Note.—This bylaw applies to nearly all the offensive trades as to storage of materials awaiting treatment.

(*b*) He shall, at the close of every working-day, cause every bench, table, wall and pavement on the premises where his work is carried on to be thoroughly cleansed by scrubbing, or some other effectual means.

7 Q.—State at what times an Inspector may demand an entrance into premises where an offensive trade is carried on?

A.—Every occupier of premises where an offensive trade is carried on shall, at all reasonable times, afford free access to every part of the premises where his trade is carried on to the Medical Officer of Health, the Inspector of Nuisances, the Surveyor to the Sanitary Authority or to any committee specially appointed for the purpose of inspecting the premises.

Note.—Reasonable times are, say, between 9.0 A.M. and 6.0 P.M., and at other times when the trade is being carried on. This applies to all offensive trades.

8 Q.—What does the model bylaw say regarding limewashing the premises where an offensive trade is carried on?

A.—Every part of the internal surface of the walls and ceiling to be thoroughly washed with hot lime at least twice in every year, that is to say, at least once during the periods between the and day of April, and the and day of October respectively.

Note.—The above applies to the trades carried on by the fell-monger, tanner, leather-dresser, tallow-melter, and fat-

extractor; the premises of the tripe-boiler and gut-scraper should be limewashed four times per year; those of glue-maker and size-maker once in every year; while the model bylaws do not ask for the premises of the blood-boiler, blood-drier and bone-boiler to be limewashed at all; no doubt any Local Authority adopting the bylaws would make the by-law for limewashing apply to all the trades.

9 Q.—State the more important particulars as regards the site and structure of a slaughter-house. Name a suitable material for the floor.

A.—The Local Government Board have given the following in their rules of construction for slaughter-houses:

(*a*) The premises to be used for a slaughter-house, or as lairs for cattle in connection with the same, should not be within 100 feet of a dwelling-house, and the site should be such as to admit of free ventilation with the external air on two sides at least. The slaughter-house should not be below the ground adjoining in any part, nor should the approach to it be on an incline of more than one in four, or through any dwelling-house or shop. No room or loft to be constructed over a slaughter-house, nor any habitable room over any lair. Through ventilation to be provided. Inside of walls to be covered with hard smooth impervious material to a sufficient height. No w.c., privy, or cesspool to be inside the slaughter-house, nor any direct communication between the slaughter-house and any stable, w.c., privy, or cesspool.

(*b*) The floor should be well paved with asphalt or concrete, laid with proper slope and channel towards a gully, which should be properly trapped and covered with a grating the bars of which should not be more than three-eighths of an inch apart.

Note.—The gully must be outside the slaughter-house and the channel lead through the wall.

10. Q.—What is said in the rules of construction regarding the water-supply to slaughter-houses and what limewashing is necessary?

A.—(*a*) The slaughter-house should be provided with an adequate tank or other proper receptacle for water, so placed that the bottom shall not be less than six feet above the level of the floor of the slaughter-house.

(*b*) This is one of the model bylaws, not a rule of construction. Every occupier of a slaughter-house shall cause every

part of the internal surface above the floor of such slaughter-house to be thoroughly washed with hot limewash, at least four times in every year; between the periods of the first to the tenth of each of the months of March, June, September, and December.

11 Q.—What time is allowed for the removal of skins, fat, offal, &c., from a slaughter-house, and what receptacles should be provided?

A.—(*a*) Within twenty-four hours after the completion of the slaughtering of any animal.

(*b*) The occupier shall provide a sufficient number of receptacles or vessels properly constructed of galvanised iron or other non-absorbent material, and furnished with closely-fitting covers for the purpose of receiving and conveying all blood, manure, garbage, filth, &c., from the slaughter-house.

12 Q.—What time is specified for the washing of floors, &c., after slaughtering or dressing? Also, what is stated in the bylaws regarding dogs in slaughter-houses?

A.—(*a*) Three hours after completion.

(*b*) An occupier of a slaughter-house shall not at any time keep any dog, or cause or suffer any dog to be kept, in such slaughter-house.

13 Q.—Define the following terms used in the model bylaws relating to new streets and buildings: "base" of a wall; "party wall," "external wall," "topmost storey," and "domestic building."

A.—Base applied to a wall means the underside of the course immediately above the footings. A party wall means a wall being used, or constructed to be used, in any part of the height or length for separation of adjoining buildings belonging to different owners, or occupied by different persons; or a wall standing beyond the projection of the footings on grounds of different owners. External wall means an outer wall of a building not being a party wall, even though adjoining to a wall of another building. Topmost storey means the uppermost storey in a building, whether constructed wholly or partly in the roof and whether for human habitation or not. Domestic building means a dwelling-house or an office building or other outbuilding appurtenant to a dwelling-house, whether attached thereto or not, or a shop, or any

other building not being a public building or of the warehouse class.

14 Q. What is given in the bylaws as a covering for the site before any domestic building is erected thereon? Also, what should be done before building upon sites which have been partly filled in with animal or vegetable refuse?

A.—(*a*) The whole ground surface or site must be covered with asphalt or a layer of good cement concrete, at least six inches thick, rammed solid.

(*b*) It must be properly removed, by excavation or otherwise, from such site.

15 Q.—Is it necessary to ventilate the space beneath the boarded floors of the lowest storey of a building? Also, what is recommended in the model bylaws for the purpose of ventilating rooms without a fireplace or flue?

A.—(*a*) Yes, by means of suitable and sufficient air-bricks or by some other effectual method.

(*b*) Every habitable room which is not provided with a fireplace and a flue properly constructed and connected with such fireplace, to be provided with special and adequate means of ventilation by a sufficient aperture or air shaft of one hundred square inches at least.

16 Q.—What proportion should the total window area bear to the floor area of a room; and what is the minimum distance allowed between a privy and a dwelling-house?

A.—(*a*) The window area must be at least equal to one-tenth of the floor area of the room.

(*b*) Six feet.

17 Q.—Should an ashpit be allowed to communicate with any drain? How should a cesspool be constructed? What is the minimum distance allowed between a cesspool and a dwelling-house?

A.—(*a*) No; no part of such ashpit is to be allowed to communicate with any drain.

(*b*) The cesspool is to be constructed of good brickwork in cement mortar, with a backing of well-puddled clay at least nine inches thick all round and under the bottom or floor. The top to be arched or otherwise properly covered over, and to have three openings, one for a ventilating shaft, one for a pump, and one for a proper airtight manhole cover to

afford access when necessary. It must be situated so that it can be emptied without the contents being carried through a dwelling-house, public building, &c.

(*c*) The distance from a dwelling-house is not mentioned in the by-laws; it is left for the Local Authority adopting them to arrange the distance, according to whether the district is urban or rural, &c.

18 Q.—What is the minimum diameter for house drains? If a house drain must of necessity pass under a building, how should it be laid and ventilated?

A.—(*a*) Four inches is the minimum.

(*b*) Such drain shall be laid in a direct line for the whole distance, and be completely embedded in, and covered with, at least six inches of good solid concrete all round. It must also be adequately ventilated at each end of the portion beneath such building.

19 Q.—Give the model bylaw relating to damp-proof courses. Is the use of a "container" and a D-trap condemned in the model bylaws?

A.—(*a*) Every person who shall erect a new building shall cause every wall of such building to have a proper damp-proof course of sheet lead, asphalt, or slates laid in cement, or of other durable material impervious to moisture, beneath the level of the lowest timbers and at a height of not less than six inches above the ground adjoining such wall.

(*b*) Yes; no container is to be fixed beneath any pan or basin of a w.c., nor any trap of the kind known as a D-trap.

20 Q.—State the amount of open space required at the front and at the rear of domestic buildings.

A.—(*a*) Twenty-four feet at the front for the whole distance of the building clear of any erection, except a porch, wall, &c., not above 7 feet high.

(*b*) 150 square feet at the least; and if the building is not over 15 feet high and does not consist of more than one storey, such distance shall be 10 feet from the back of the house and parallel to it, and clear of any erection except a w.c., e.c., or a privy and an ashpit. If the building is over 15 feet high, but not over 25 feet high, such distance to be 15 feet at the least. If the height is over 25 feet, but not

over 35 feet, such distance to be 20 feet at the least. If the height is over 35 feet such distance to be 25 feet.

Note.—The height of a building is measured from the level of the ground or yard to half way up the roof.

21 Q.—Is it allowable to have an inlet to a drain inside a building? Also, state how waste pipes should discharge.

A.—(*a*) No; except that of a properly trapped and ventilated water-closet or slop-sink.

(*b*) All waste pipes (except slop-sinks) shall be taken through an external wall and discharge in the open air over a channel leading to a trapped gully at least eighteen inches distant.

Note.—The model by-laws do not mention that waste-pipes should be trapped by a S or P trap immediately under the fitting, but this should be insisted upon.

22 Q.—What is recommended in the model bylaws with respect to the size, situation and ventilation of soil-pipes? Has the soil-pipe to be trapped at the foot?

A.—(*a*) Not to be less than four inches in diameter, to be fixed outside, and to be continued upwards without diminution of its diameter; no bends or angles, except where unavoidable, to be in a soil-pipe, which is to be carried to such a height and in such a position as to afford by means of the open end a safe outlet for sewer air.

(*b*) No; no trap is allowed, except the trap to the water-closet and the interceptor trap at the nearest point to the sewer within the curtilage or site of the building.

23 Q.—Has section 157 of the Public Health Act, 1875, relating to Urban Authorities making bylaws for new streets and buildings been extended by a later Act? Also, is there any limit of the time named in the former Act in which complaints shall be made and proceedings taken?

A.—(*a*) Yes; section 23 of the Public Health (Amendment) Act, 1890, where adopted, gives any Urban Authority power to make bylaws as to (1) adequate water-supply for flushing w.c.s (for old buildings as well as new); (2) height of rooms; (3) construction of floors, hearths and staircases; (4) paving of yards and open spaces in front of houses; (5) also back streets or passages for removal of refuse.

(*b*) Yes; six months.

24 Q.—State whether the powers of an Urban Authority in section 314 of the Public Health Act, 1875, to make bylaws for hop-pickers, have been extended by the passing of a subsequent Act.

A.—Yes; by the passing of the Public Health (Fruit Pickers) Act, 1882, for securing the decent lodging and accommodation of persons engaged in picking fruit and vegetables.

LESSON XIV

MISCELLANEOUS

1 Q.—Briefly enumerate the nuisances upon which Local Authorities may make bylaws when they themselves do not undertake the necessary work.

A.—By section 44 of the Public Health Act, 1875, it is enacted that where the Local Authority do not themselves undertake or contract for the cleansing of footways and pavements adjoining any premises; the removal of house refuse from any premises; the cleansing of earth-closets, privies, ashpits and cesspools belonging to any premises, they may make bylaws imposing the duty upon the occupiers.

2 Q.—Name the principal points to be observed as regards the authentication of notices and the method of service of the same.

A.—Sections 266 and 267 of the Public Health Act, 1875, deal with these matters. They are briefly as follows: "Notices, orders, &c., may be in writing or print, or partly in writing and partly in print; they must be signed by the clerk to the Local Authority or their Surveyor or Inspector of Nuisances.

"They may be served by delivering them to, or at the residence of, the person to whom they are addressed, or by delivering the same, or a true copy, at the premises which the person occupies, or be sent by prepaid letter by post."

Note.—To be legal the notice must not be served until the matter has been reported to the Local Authority, and they have passed a resolution to serve a notice. Action must be taken within six months.

3 Q.—Write out a copy of the notice you would serve upon the owner to provide a drain to a house.

A.—

NOTICE.

To the Owner of the Dwelling House, No. Road.

We, the Mayor, Aldermen and Burgesses of the Borough of in the County of acting by the Council as the Urban Authority for the said Borough, Hereby give you notice that Whereas the above-named house, within the said Borough is without a drain sufficient for the effectual drainage thereof, and hereby require you, in pursuance of the provisions in that behalf of the Public Health Act, 1875, to make within the space of fourteen days from the service of this notice upon you, a covered drain (or drains) from the said house to and emptying into the sewer in Road, according to the following directions, that is to say, the size of drain to be 6 inches, with 4-inch branches, the materials to be glazed, socketed, stoneware pipes, the level to be , and the fall to be not less than 1 in 60.

And, we give you further notice, that if the above Notice is not complied with, we shall execute the works required and recover the expenses thereof in manner provided by the said Act.

Dated this day of 190 ,

(Signed)

Surveyor.

4 Q.—Give the principles which the Royal Commission on tuberculosis recommend should be observed in the inspection of tuberculous carcases of cattle.

A.—(*a*) When there is miliary tuberculosis of both lungs

(*b*) When tuberculous lesions are present on the pleura and peritoneum

(*c*) When tuberculous lesions are present in the muscular system or in the lymphatic glands embedded in or between the muscles

(*d*) When tuberculous lesions exist in any part of an emaciated carcase

} the entire carcase and all the organs may be seized.

(*a*) When the lesions are confined to the lungs and the thoracic lymphatic glands

(*b*) When the lesions are confined to the pharyngeal lymphatic glands

(*c*) When the lesions are confined to any combination of the foregoing but are collectively small in extent

} the carcase, if otherwise healthy, shall not be condemned, but every part of it containing tuberculous lesions shall be seized.

In view of the greater tendency to generalisation of tuberculosis in the pig we consider that the presence of tubercular deposit in any degree should involve seizure of the whole of the carcase. In respect of foreign dead meat, seizure shall ensue in every case where the pleura have been stripped.

5 Q.—How may a Rural Authority acquire the powers of an Urban Authority under the Public Health Act, 1875?

A.—Section 276 of the Public Health Act, 1875, empowers the Local Government Board to grant conditionally, or unconditionally, on the request of a Rural Authority or of the ratepayers representing one-tenth of the rateable value, all or any of the powers of an Urban Authority for the district or for a contributory part only.

6 Q.—Is there a saving clause in the Public Health Act, 1875, specially protecting mining interests?

A.—Yes; section 334 of the Public Health Act, 1875, says: "Nothing in this Act shall interfere with, or injuriously affect, any mining or smelting works."

7 Q.—Sketch and describe a combined system of back drainage (leading to a public sewer) for a terrace of houses, showing the house connections, positions of traps and ventilators.

A.—(*a*) (*See* opposite.)

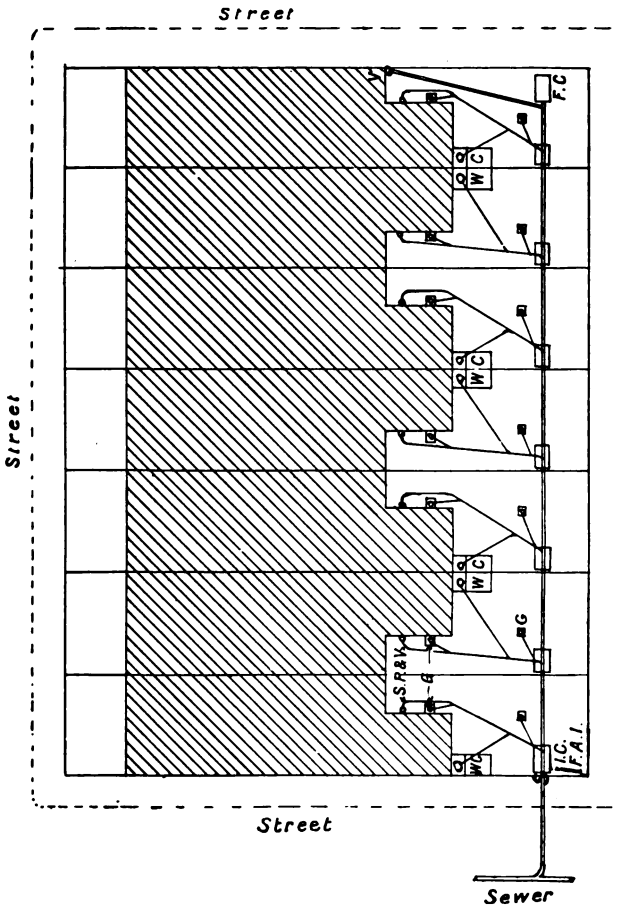


FIG. 39.

(*b*) If the sewer in the street is a brick one the 9-inch combined drain or sewer should be connected to it by a proper stoneware block, and if it is a pipe sewer a proper saddle connection should be neatly inserted. The 9-inch drain is then continued at a fall of not less than 1 in 90 (more if possible) to the manhole or inspection chamber, *I.C.*, in the first yard where a proper intercepting trap, *S.*,

with a cleansing arm, should be fixed on the drain on the sewer side of manhole; the drain is then continued along or through all the yards with a manhole in each yard at the junctions where shown on sketch-plan. At the top end of the combined drain it should be diminished to 6 inches in the top yard and terminate in a proper flushing chamber, *F.C*, built underground, similarly to an ordinary manhole, but lined with cement to make it water-tight, with a valve to stop up the outlet which, when released, will flush the drain; the 9-inch interceptor will require to be flushed at short intervals. *A* is a 6-inch sewer vent with a rust-pocket fixed at the bottom in place of the ordinary bend. A fresh-air inlet, *F.A.I.*, is shown to be taken from the inspection chamber and, say, six feet up the nearest wall.

8 Q.—What quantities of the following materials should be purchased under the Sale of Food and Drugs Acts in order that the one-third part would be sufficient for the purposes of analysis; beer, butter, milk of sulphur, wheat-flour, gin and olive oil.

A.—Beer, one gallon; butter, 1 lb.; milk of sulphur (and drugs generally), 4 ounces; flour, 2 lbs.; gin (and other spirits), 1 pint; olive oil, 4 ounces.

Note.—Although the above fully answers the question, I give the following for the guidance of students; bread, 4 lbs., tea, coffee, chicory, and mustard, 4 ounces; pepper 2 or 4 ounces; vinegar, 1 pint; aerated waters, 3 bottles; milk, 1 quart (I have known 1 pint only to be bought); lard, $\frac{1}{2}$ lb.

9 Q.—What is the difference between a disinfectant, an antiseptic, and a deodorant.

A.—A disinfectant is a substance capable of destroying infection, as the term means the destruction of the particular germ or micro-organism which is the cause of the infection.

An antiseptic is a substance which will not destroy germs, but will arrest and impede putrefaction and the growth of microbes.

A deodorant is a substance used for removing, covering, and destroying unpleasant smells.

Note.—A substance which is a deodorant or antiseptic is not necessarily a disinfectant, and *vice-versâ*.

10 Q.—How long will it take to fill a cistern 5 feet × 4 feet × 3 feet 6 inches through a pipe 1 inch in diameter, the rate of flow being 3 feet per second.

A.—Find the number of cubic inches in the cistern; this is found by multiplying the measurements together, and the result by 1728, which is the number of cubic inches in one cubic foot, as follows: $5 \times 4 = 20 \times 3{\cdot}5 = 70$ cubic feet $\times$ 1728 = 120,960 cubic inches in the cistern. Next find the number of cubic inches flowing into the cistern per second. This is found by multiplying the rate of flow, or velocity, by the area of the pipe, as follows:—Area of pipe = ·7854 of an inch $\times$ 36 (inches per second) = 28·2744 cubic inches per second entering cistern. Divide the 120,960 by 28·2744 which gives the number of seconds it takes to fill the cistern = 4278 or 71 minutes 18 seconds, or 1 hour 11 minutes 18 seconds.

Note.—At the "exam" all the working figures are required *to be shown* in calculations.

11 Q.—Describe how you would proceed to examine, and determine, whether a schoolroom is (*a*) overcrowded, (*b*) insufficiently lighted, (*c*) badly ventilated.

A.—(*a*) I should proceed to measure the room and find the number of cubic feet of air-space contained in it; then count the number of scholars in the room; divide the cubic contents by the number of scholars, which will give the amount of air-space per scholar; if less than 80 cubic feet each, the room is badly overcrowded.

(*b*) In ordinary dwelling-houses the window area should equal at least $\frac{1}{10}$ of the floor area, but in schools this would not be sufficient, as every part and corner should be fully lighted. The light should, as far as possible, come from the left side of the scholars. When this is impossible right light is next best, and, under no circumstances should light be admitted full in the eyes of the scholars or teachers. In rooms 14 feet high, any space beyond 24 feet from the window wall is insufficiently lighted. All kinds of glass which diminish the light should be avoided. The sills of the main windows should not be more than 4 feet above the floor; and the tops of some windows should reach nearly to the ceiling. Skylights are objectionable.

(*c*) Inlets should provide a minimum of $2\frac{1}{2}$ square inches per child, and outlets a minimum of 2 inches. All inlets and outlets should be in communication with the external air. Outlets should be by a warm flue or exhaust, as otherwise they will act as cold inlets, and they should be at or near the highest part of the room. Inlets are best placed in the corner

of rooms furthest from doors and fireplaces, and should be arranged to discharge upwards into the room. Windows should be arranged as hoppers at the bottom, and the top near the ceiling should also swing open, so as to allow stagnant air to escape and clear the room ; this is in addition to the inlet and outlet openings, which should be open constantly.

12 Q.—Draw a plan and section showing an inspection chamber with intercepting trap and fresh-air inlet, and with one branch drain entering at right angles.

A.—See Figs. 40 and 41.

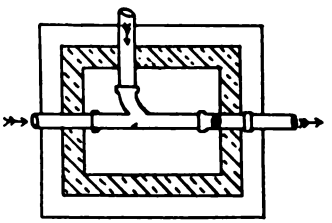


FIG. 40.

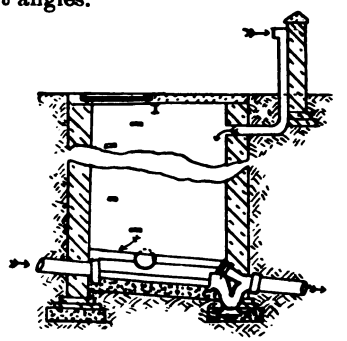


FIG. 41.

13 Q.—Draw sections showing three different ways by which cellar, or basement, walls may be kept dry on the inside.

A.—See Figs. 42, 43 and 44.

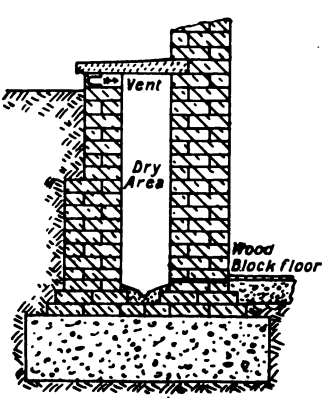


FIG. 42.

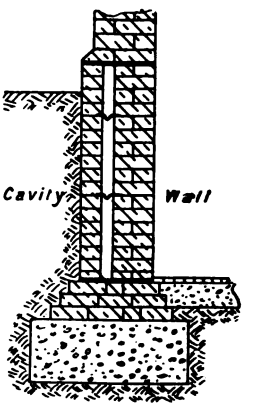


FIG. 43.

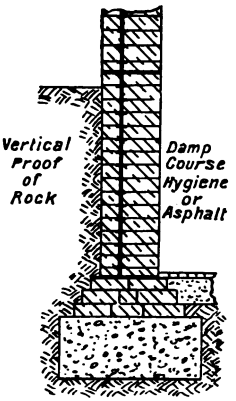


FIG. 44.

14 Q.—A well is suspected of being polluted by leakage from a drain which passes within 10 feet of it. Explain exactly, step by step, the kind and method of the investigations you would make in order to ascertain whether the well water is receiving pollution.

A.—If possible, I should prove first whether the drain was leaking or not, by stopping up the outlet and filling with water to the highest gully, or test the length running past the well. If the drain was water-tight the pollution must be looked for from some other source, and if not water-tight, it should be taken up and made so, by relaying if necessary.

15 Q.—Give your views as to the way to ensure the effective scavenging of a main thoroughfare in a large town, the road being asphalted or wood-paved.

A.—Hold some one responsible (a good foreman) for seeing the work done; the roadway should be gone over in the early morning with the horse broom before the business of the day has begun. The watering-cart should precede the broom, if the weather is dry, to keep down the dust. A large staff of good men with brooms and shovels, and plenty of horses and carts, should be at hand to sweep the dust and refuse into heaps and shovel it into the carts. It would also be advisable, to prevent the roadway getting greasy, to well flush or wash the pavement occasionally by means of hose-pipes connected to the street hydrants, one man with a hose-

pipe flushing the roadway, and about six men across the road with brooms sweeping the water and dirt in front of them. Of course the gulleys would catch a lot of this, and would require emptying out as soon after as possible.

16 Q.—Describe the method of disinfection which you would recommend during the illness of a patient with enteric (typhoid) fever; distinguish between houses which use (*a*) a pail closet, (*b*) a privy, and (*c*) a water-closet.

A.—In every case the excreta and all discharges from the bowels should be thoroughly disinfected before transferring them to the pail, privy, or w.c.; the best way to do this is to have some strong disinfectant in the vessel which receives the discharge direct from the bowels. A strong solution (1 in 1000) of corrosive sublimate is best. The bowel discharge should be well mixed with the disinfectant by stirring or otherwise.

(*a*) Where a pail is in use a separate pail should be provided with an air-tight cover, the contents emptied regularly, and either burnt in a destructor, or buried a good depth and far away from houses or any source of water-supply.

(*b*) Where a privy is in use this should be emptied frequently, and a disinfecting powder, such as carbolic acid powder, or chloride of lime, spread over it so as to cover it completely. It should be thoroughly emptied, cleansed, and disinfected on the recovery or removal of the patient.

(*c*) Where a water-closet is in use, after the contents are thoroughly mixed, it only remains to thoroughly flush the w.c. with water, to which could be added some more disinfecting solution.

17 Q.—A person who has purchased from a butcher's stall a pair of kidneys that are obviously diseased, brings them to you as an Inspector. Describe in detail how you would act.

A.—Unless the Public Health (Amendment) Act of 1890 has been adopted no action could be taken, except that I should at once visit the stall and make an inspection, to see if the butcher had any more diseased meat or flesh exposed, or intended for sale; if so, I should seize it and take it to a justice to be condemned, and then see it destroyed or buried, and report to the Sanitary Authority as given in answer to Question 1 in Lesson VI. If the Public Health (Amendment) Act, 1890, has been adopted, the butcher could be summoned, even if the kidneys had not been seized as mentioned

in section 116 of Public Health Act, 1875. (*See* answer to Question 2 in Lesson VI.)

18 Q.—Describe and sketch a good form of waste (or slop) water-closet. Also enumerate the advantages and disadvantages of this form of closet.

A.—(*a*) Ducketts, of Burnley, make a good form of slop or waste water-closet (or tipper closet as they are often termed in the building trade). It consists of an oval pan or shaft which reaches from the seat down to the drain-trap which is connected to the sewer in the passage or street. The depth of the trap below the seat varies according to the distance of the drain below the surface. The oval pan is part of a large chamber which reaches under the floor of the w.c., and at the opposite end is pivoted a tilting vessel or tipper, which holds from three to four gallons when full. The drains from the sink, bath and lavatory waste-pipes, also the roof and yard surface water, should all discharge over and into the tipper, which is so balanced that when nearly full it overturns (or tips) and discharges its contents into the oval pan, which has an opening in the centre leading to the trap; an annular ring is so formed in the oval pan round the centre opening as to hold water.

(*b*)—

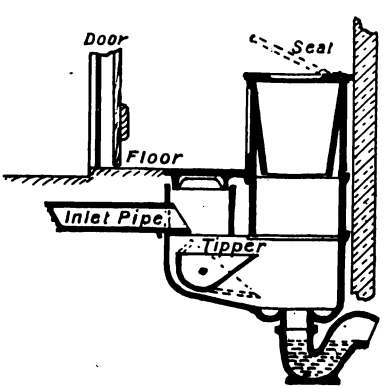


FIG. 45.

(*c*) The advantages are: cheaper in first cost and also in maintenance, as there are no expensive fittings nor plumbers' bills, it being fixed by a mason, or bricklayer and his labourer,

No water rate and a great saving in the water-supply, as only waste water is used to flush these closets. The volume of sewage to be dealt with is considerably less than is the case where ordinary w.c.s are in use. No freezing in the winter time, with its expense and inconvenience.

The disadvantages are few, and the only one of any weight is, that this closet is not so cleanly as the ordinary w.c., but for outdoor use this is not so important.

19 Q.—What is the Plenum method of ventilation, and for what purpose would you consider it suitable? A chimney flue nominally 14 inches by 9 inches, plastered inside, has an upward current of 3 feet per second, what quantity of air will pass up it in one hour?

A.—(*a*) The Plenum method of ventilation is the forcing or propulsion of air into a building, and is only suitable for public buildings, such as hospitals, &c.

(*b*) First, find the area of the flue in square feet.

In this case the 14 inches by 9 inches flue after plastering, may be taken as 13 inches by 8 inches to allow of half an inch of plastering (termed pargetting).

This can be taken as approximately $\frac{3}{4}$ of a square foot in area, thus:—

$13 \times 8 = 104$; the area of a square foot is $12 \times 12 = 144$, three-fourths of which is 108, so that 104 can be taken as approximately $\frac{3}{4}$ of a square foot.

Then:—

Area = ·75 of a square foot, which multiplied by the velocity (in this case 3 feet per second) gives the cubic feet per second passing up the flue.

Thus:—$\cdot 75 \times 3 = 2 \cdot 25$ cubic feet per second.

and $2 \cdot 25 \times 60 = 135$ cubic feet per minute,

and $135 \times 60 = 8100$ „ „ hour

passing up the flue.

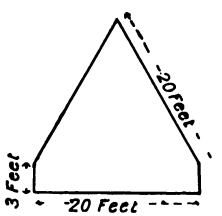


FIG. 46.

Note.—No deduction is made for the roughness of the plaster, as the question says 3 feet per second *will* pass up flue.

20 Q.—What is the total capacity of a bell tent of the dimensions shown in the accompanying section, deducting a centre pole 6 ins. diameter.

A.—We must first find the cubic contents of the bottom part which is circular on plan with a diameter of 20 feet, and a height of 3 feet; then $20 \times 20 = 400$, and $400 \times \cdot 7854 = 314 \cdot 16$ square feet (area of floor) Then $314 \cdot 16 \times 3 = 942 \cdot 48$ cubic feet in bottom portion of tent. Now, the upper part is a cone with a base 20 feet in diameter, and, to find its height, we must square the slant side, and from the result deduct half the diameter squared. Thus $20 \times 20 = 400$ (slant side squared) and $10 \times 10 = 100$ (half the diameter squared). Then $400 - 100 = 300$, and the square root of this $= 17 \cdot 32$ (approximately) which is the height of the cone required. The cubic contents of a cone equals the area of its base, multiplied by one-third the height; in this case one-third of $17 \cdot 32 = 5 \cdot 77$ approximately, and $314 \cdot 16$, area of base, $\times 5 \cdot 77 = 1812 \cdot 7$ cubic feet, add the contents of both portions together, thus:—$942 \cdot 48 + 1812 \cdot 7 = 2755 \cdot 18$ = total cubic contents of tent: from which we must deduct the tent-pole, which is 3 feet + 17·32 feet long, or high = 20·32 feet, and which is 6 inches in diameter. The sectional area of tent-pole is then found in square feet, and multiplied by its height. As 6 inches = ·5 feet, then ·5 feet × ·5 feet = ·25 feet, this multiplied by ·7854 = ·196350 square foot = sectional area. This multiplied by the length in feet = ·196350 by $20 \cdot 32 = 3 \cdot 99$ cubic feet (approximately) in the tent-pole. Now $2755 \cdot 18 - 3 \cdot 99 = 2751 \cdot 19$ cubic feet (answer).

21 Q.—A village has to be scavenged on the "Conservancy" system. Describe in detail how you would arrange this.

A.—Provide circular dust bins of galvanised iron, with loose covers or lids, one to every house, and sooner than that the larger houses, hotels, &c., should have very large bins, provide two smaller ones for them. Let a proper covered place or shed be erected in the yard to keep the bin under. Arrangements should be made to have all the bins emptied once per week; to do this, the village should be divided into districts, and one or more horses and carts told off to attend to each district along with the necessary number of men; a driver and two men to each horse and cart. The bins are emptied in the day time, the two men carrying them from the yards, and tipping the refuse into the carts. As privies are in my opinion better than pails, I should advise that one ashpit be erected to two privies, that it be in the centre, and provided with a grating on the top of which all ashes are placed and

riddled; the finer ashes that go through to be so distributed by sloping flags or stones as to fall on the excreta in both privies. The larger cinders can either be taken back into the house to burn again or be thrown into the bin. The privies should be emptied during the night through a door opening from the ashpit into the back street. Carts with collapsible covers, which form windguards when open, should be used for the dry ashes and refuse. If no refuse destructor is provided, the refuse from the bins should be tipped in hollow places in fields, &c., far removed from dwellings; the fine ashes and excreta can be sold or given to farmers for manure, or otherwise disposed of.

22 Q.—What do you understand by superheated, and by saturated, steam? Also by the term "latent heat?"

A.—(*a*) Saturated steam is water vapour at a temperature very slightly above that at which it has been generated, and, thus in such a state that it will condense immediately upon any article that is slightly colder than itself. If saturated steam is further heated a few degrees, the vapour partakes more of the physical character of a gas and becomes superheated.

(*b*) Latent heat is given out when steam condenses into water. To make 1 lb. of boiling water into steam of the same temperature absorbs as much heat as would raise 963 lbs. of water one degree Fahr. in temperature, or 1 lb. of water 963 degrees in temperature, and it is this heat which the steam gives out on condensing which is termed "latent heat."

23 Q.—What kind of a disinfector would you recommend for (*a*) a large manufacturing town; (*b*) a poor rural district? Give your reasons.

A.— (*a*) There are several disinfectors which are suitable for large towns; as, for instance, those made by Messrs. Goddard, Massey and Warner; and Manlove, Alliot and Co.; both these firms also make Washington Lyon's type of disinfector. Also the Equifex Saturated Steam Disinfector.

(*b*) For a poor rural (or small urban) district I should recommend a Thresh's or Reck's disinfector.

(*c*) All the above are efficient disinfectors, and the only reason for recommending Thresh's disinfectors or Reck's

apparatus is because they may be purchased at about half the cost of the others.

24 Q.—Draw a plan showing how you would arrange a disinfecting apparatus in a small disinfecting station. Stable may be omitted, but show van sheds.

A.—Fig. 47.

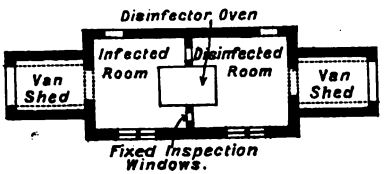


FIG. 47.

LESSON XV

VIVA-VOCE QUESTIONS AND ANSWERS

1 Q.—Do you know any simple method of testing cement?
A.—The best and simplest test for cement for drain-pipe joints is to mix some cement thin enough to pour into a bottle and allow it to set (say for twenty-four hours). If it expands it will have cracked the bottle, and if it shrinks it will rattle loosely in the bottle. The strength to a few pounds is not of so much importance for this purpose, as non-alterability in the volume of the cement; as, if it expands it will burst the sockets of the pipes; and if it contracts it allows the joints to leak, so that in either case the drain would not be water-tight even when newly laid.

2 Q.—Why are pipes, &c., made shiny or glazed?
A.—To make them non-absorbent, that is, to prevent the sewage soaking into and through them. The glaze also increases the velocity of the sewage by lessening friction, thus preventing deposits.

3 Q.—What kind of an article is this? (The examiner here showed to the candidate a small model of a wash-down closet basin.)
A.—A model of a pedestal wash-down w.c.

4 Q.—Where does the water come in?
A.—At the hole through the lug, or projection, at the top and back of the basin.

5 Q.—What is this hole for? (The examiner here pointed to the hole through the lug, or projection, on the outlet of trap.)
A.—To connect the air or anti-syphonage pipe to.

6 Q.—Would you pass that wall or building? (The examiner here produced a tracing showing a section of a wall without any damp-proof course.)
A.—No; the wall requires a damp-proof course, and a dry area, or a cavity wall if the basement floor is below ground level.

7 Q.—What are damp-proof courses for?
A.—To prevent the damp in the soil or ground rising up the walls into the rooms and to the floor timbers.

8 Q.—What are they made of?
A.—Lead, slates laid in cement mortar, asphalt, pitch and tar, several kinds of felt, &c., also, ventilated stoneware slabs.

9 Q.—How would you test a new drain?
A.—By the water test.

10 Q.—An old drain?
A. By water, if possible; if not, by the smoke test.

11 Q.—What velocity should the sewage from a house drain flow at?
A.—Three feet per second.

12 Q.—How would you test the quality of drain-pipes if you had to pass them?
A.—Examine them carefully to see that they were straight in length, truly circular in section, well glazed (especially inside) and had no firecracks or air (or pin) holes; also tap them with a hammer and hear them give out a true ring.

13 Q.—How would you judge a piece of meat as to its soundness?
A.—By carefully examining it, and if not satisfied by sight and smell outwardly, thrust a knife or sharp instrument right to the bone, withdraw it quickly and smell.

14 Q.—How would you proceed if you found a nuisance to exist on any premises?
A.—If the owner or occupier would not remedy it, by seeing him and asking him to do so; I should report it to the Sanitary Authority at their next meeting, who should pass a

resolution to serve a notice upon whoever is responsible. If a structural nuisance, the owner; if not, the occupier.

15 Q.—What should be done to the notice to make it legal?
A.—It must be signed by the clerk or inspector to the Local Authority, and a resolution must have been passed (by the Local Authority, before it is sent) ordering a notice to be served.

Note.—All the above were asked of one of my students at the Viva-voce Examination at Manchester in 1898, and as many of the above questions were asked of other students at this, and subsequent examinations, I will only give those that differ from the above.

16 Q.—What flush would you give a w.c.?
A.—Three gallons.

17 Q.—Can you get that at your place?
A.—Yes.

Note.—In the case of this student he came from a place where three gallons were allowed, I might say, even insisted upon.

18 Q.—But do you know you cannot get three gallons in a large number of places?
A.—Yes.

19 Q.—What size of a pipe would you allow to be fixed between the cistern and w.c. basin.
A.—One and a half inch diameter lead pipe.

20 Q.—Would not less do?
A.—No; not to efficiently flush the w.c., unless the cistern was over six feet above the w.c. pan. Then one and a quarter inches would do.

21 Q.—What would you call heating a room by means of a stove?
A.—Convection.

22 Q.—How is the room warmed by convection?
A.—The air in contact with the stove becomes warm, and, being lighter than the cold air, it then rises and the colder air descends to become warm in its turn, and so the moving masses of air become warmed throughout.

23 Q.—Would you recommend this method of warming a room?
A.—No as there is no ventilation with this method like there is with the open fireplace, also the stove burns the air in contact with it and dries up all the moisture in the air.

24 Q.—What remedy could you propose for the stove burning or drying up all the moisture in the room?
A.—Keep an open vessel full of water on top of the stove.

25 Q.—What head of water would you use when testing drains?
A.—About five feet.

26 Q.—What pressure would there be at the bottom per square inch?
A.—·433 × 5 = 2·165 feet, or just over 2 lbs. per square inch.

27 Q.—How would you lay drains in soft ground which is running with water?
A.—Use patent joints, so that no cement need be used, as the Stanford, Doulton, Hassell, Sykes, &c., or, if ordinary pipes are used, lay them on 11 inch by 3 inch planks, if necessary supported on piles driven into the soft ground and sawn off level, or rather to the proper inclination; or, if possible, concrete under the pipes by making a trench and sump for the water, clear of the pipe track, keeping the water down by pumping.

28 Q.—Will the velocity be the same in large sewers as in small ones?
A.—It depends upon what quantity of sewage is running through them, and on the fall and roughness of the interior. With the same volume of sewage and the same fall and roughness, the velocity would be greater in the smaller sewer, because it would be flowing more full.

29 Q.—A sketch was shown to this student showing a sink waste-pipe, trapped by a dipstone trap inside the house, bath waste-pipe not trapped, no damp-proof course, nor open area, and the soil-pipe terminating near windows in roof. The student was asked to point out defects and remedies. As I have mentioned the defects, the remedies are:
A.—The sink and bath-wastes should be trapped inside by a S or P trap, and be taken immediately through the wall, and cut short off over a channel leading to a gully at least

18 inches distant. The dipstone trap and drain inside the house should be taken up, and all soiled ground around same taken away. A damp-proof course should be inserted in the wall below the lowermost floor, and if this floor is below the ground outside, a dry area should be made between the ground and the wall, if possible; and if not, where there is no garden or spare land, cement the face of the wall, or build a $4\frac{1}{2}$-inch wall 1 inch from the face of the house wall, and fill up the space with asphalt or hygiene rock. The upper end of the soil-pipe should be taken clear above, or far removed from all windows that open and from chimneys.

30 Q.—Three small quantities of some powdered material on pieces of paper were here shown to this student, and he was asked to name them. They would most likely be Portland cement, roman cement and lime, or, perhaps, fine sand.

31 Q.—A sketch section of a house was shown to this student, showing ground and first floors, joists, roof and ceilings. On the ground floor was a sink with S trap on waste-pipe, but no gully outside, so of course it was not disconnected from the drain. On the first floor there was a w.c. properly connected to a soil-pipe outside, but no separate water-waste-preventing cistern to flush w.c. These should be mentioned, as the candidate was asked to point out what was wrong and how it could be remedied.

32 Q.—The examiner, when the candidate had pointed out the above defects, asked what was the use of the small cistern to the w.c.?

A.—To prevent the fouling of the drinking-water in the storage cistern, and also to prevent the waste of water.

33 Q.—(*Note.* The examiner here asked the candidate how, or in what way, the w.c. could foul the water in the cistern above.)

A.—By the odour ascending the flush-pipe, and gaining access to the water above when the chain is pulled.

34 Q.—What would you do with the overflow pipe from the storage cistern?

A.—Take it straight through the external wall and cut it off short in the open air.

35 Q.—What is the meaning of ground air, and how can it gain access to a dwelling-house?

A.—Ground air is the air in the ground or soil between the level of the subsoil water and the surface, and it gains access to dwelling-houses when there is no concrete or asphalt covering over the whole site of the house. The inside of the house being warmer, usually, than outside, attracts or draws the air; also the rising of the subsoil water discharges the ground air into the atmosphere, and into houses where the covering mentioned has been omitted.

36 Q.—What is a drain?

A.—According to the Public Health Act, 1875, a drain is any drain which takes the sewage from one house or building only or from premises in the same curtilage.

37 Q.—What is a sewer?

A.—All sewers which take the sewage from more than one house or premise, except sewers made by any person for his own profit, or made and used for draining or irrigating land, or under Commissioners of Sewers appointed by the Crown.

38 Q.—What is this? (*Note.*—The examiner here showed the candidate a rough sketch, showing two houses connected to a passage sewer, and pointing to the sewer in the passage asked, "What is this?" *See* Fig. 48.)

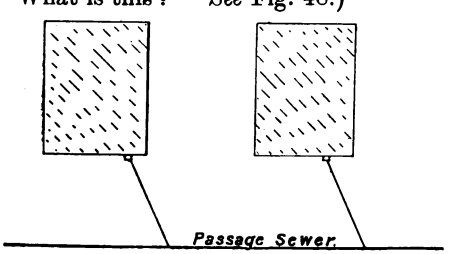


FIG. 48.

A.—A sewer.

39 Q.—What is the pressure of water at a point in a pipe like this? (*Note.*—A sketch was shown to the candidate showing a cistern full of water, and a pipe from the bottom taken

vertically down for a distance of 20 feet, then horizontally for a distance of 20 feet, and the point marked X.)

A.—It is only the vertical height that is taken into account for pressure, so $\cdot 433 \times 20 = 8 \cdot 66$ lbs. per square inch pressure at point X. (*See* Fig. 49.)

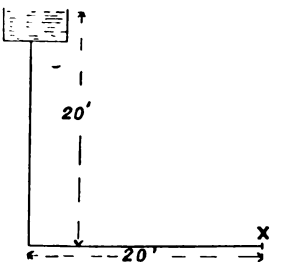


FIG. 49.

40 Q.—How would you measure a triangle like this? (*See* Fig. 50.)

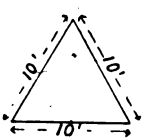


FIG. 50.

A.—Add the three sides together, divide the result by two, then from the half sum of the three sides subtract each side separately; multiply the three results together and extract the square root, which gives the area required. The formula being area $= \sqrt{S\,(S-a)\,(S-b)\,(S-c)}$, then where $S = \frac{1}{2}$ the sum of the three sides, and a, b, c = the three sides, area $= \sqrt{15(15-10)(15-10)(15-10)} = \sqrt{15 \times 5 \times 5 \times 5}$ $= \sqrt{1875} = 43 \cdot 3$ (approximately) feet, if the length of the three sides are in feet, or inches, if the sides are given in inches, &c.

41 Q.—Supposing a man had a cart-load of cheese which was bad, under what section and Act could you seize it?

A.—The cheese could not be seized unless the Public Health (Amendment) Act of 1890 had been adopted, which Act, by section 28, includes all articles used by man as food.

The Public Health Act, 1875, mentions certain articles of food which can be seized, but cheese is not mentioned, nor eggs, so the Inspector must proceed under the Amendment Act if adopted, and if not he could not seize the cheese.

42 Q.—Supposing a man had a farmyard full of poultry which was a nuisance, would you ask him to remove the same, or how would you do?

A.—I should ask him to remove the nuisance, but he could not be made to remove the poultry. I am supposing the nuisance to be from smell, caused by neglect of cleansing after the poultry and, perhaps, decayed vegetables, fish, fruit, and flesh lying about; if he did not do so, I should then report the matter to the Sanitary Authority, who should order a notice to be served on him and summon him before a Court of Summary Jurisdiction, if he did not abate the nuisance in a given time stated in the notice.

Note.—If the nuisance is caused by noise only, the Inspector of Nuisances has nothing to do with the matter, and the person annoyed must take proceedings himself.

43 Q.—How many persons will it take to consume the same amount of air as one gas burner?

A.—An ordinary gas burner will consume about four cubic feet of gas per hour: and will, therefore, require a supply of about 6000 or 7000 cubic feet of air per hour, or as much as required by two adult persons.

44 Q.—What is a model bylaw?

A.—It is a bylaw made by the Local Government Board for the guidance of Local Authorities in the making of bylaws.

45 Q.—How would you disinfect a drain?

A.—I should have it well flushed, by suddenly pouring down it a large tub-full of water, to which has been added a solution of carbolic acid or some other disinfectant. The best way would be to stop the drain by means of a plug at its lower end (say in a manhole), then fill it with a solution of 1 in 1000 of corrosive sublimate and let it stand awhile, then well flush afterwards with clean water.

46 Q.—How many gallons would a 4-inch drain 20 feet long contain?

A.—Square the diameter of the pipe in inches and multiply

by ·034, which gives the gallons (approximately) in 1-foot length of pipe, then multiply by length of pipe in feet: thus $4 \times 4 = 16 \times \cdot 034 = \cdot 544 \times 20 = 10 \cdot 88$ gallons in the drain (approximately).

47 Q.—Why multiply by ·034?
A.—It is the quantity or amount in gallons (or part of a gallon) contained in a pipe 1 inch in diameter and 1 foot long.

48 Q.—What is Condy's Fluid composed of?
A.—It is said to consist of solutions of the alkaline manganates and permanganates. The manganates (which are green crystals) are soluble in water. The permanganates are deep purple crystalline salts.

49 Q.—How many gallons of water would a bucket hold?
A.—This depends upon the size of the bucket. An ordinary sized bucket holds about two gallons. The way to find the quantity by calculation is to find the cubic contents in feet, and multiply by 6·25, the quantity of gallons (approximately) in a cubic foot. A bucket is a frustum of a cone, and the formula for a frustum is: $1/3\ H\ (A + a + \sqrt{Aa})$, where H = height of frustum, A = area of base or large end, and a = area of top or small end.

50 Q.—What is the weight of one gallon of water?
A.—Ten lbs.

51 Q.—How many cubic inches are there in a gallon of water?
A.—277·274.

52 Q.—What is water composed of?
A.—By weight: Sixteen parts of oxygen and two parts of hydrogen. By measure: One part of oxygen and two parts of hydrogen. The latter is generally expressed by the chemical formula, H_2O.

53 Q.—What is the weight or pressure of the atmosphere?
A.—14·706 lbs. per square inch, usually taken at 15 lbs. per square inch.

54 Q.—How do you test drains by the "scent," or "smell," test?
A.—There are several ways: (1) By pouring down the drain or soil-pipe a solution of oil of peppermint or some other

strong smelling liquid in water; (2) a better way is to use a "Banner's" drain explorer, by introducing a glass grenade through the water seal of a trap, such as a gully or w.c., and then to break the glass grenade and release the substance it contains, which gives off a pungent odour.

55 Q.—Describe a "Banner's Drain Explorer," and a "Glass Grenade."

A.—The "Explorer" consists of a grooved wooden ball, about 2½-inch diameter, containing a strong spiral spring, fixed in the ball in a hole bored down to or below its centre. The glass grenade is a hermetically sealed tube of thin glass, about 2 inches long, which contains a chemical possessing a powerful and penetrating odour; in shape it is like a spirit level tube.

56 Q.—How do you fix the glass grenade in the "Explorer," and how do you use it when fixed?

A.—The spring inside the ball is first compressed by means of a short lever, which is fixed or pivoted at one end to a

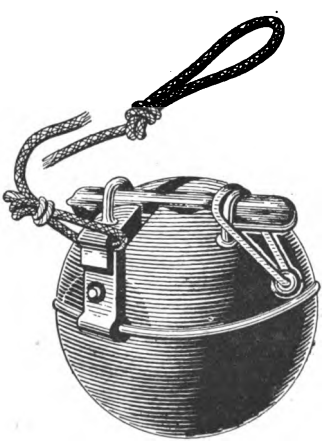


FIG. 51.

brass or copper wire (which encircles the ball) sunk in a groove. The free end of the lever is held down by a clip (which is also hinged or pivoted on the wire); to the free end of the clip is fixed a long cord for the purpose of pulling

the clip off the lever, and releasing the spring, thus breaking the glass grenade; the cord is also used to draw back the "Explorer" after the test is complete. A glass grenade is then placed under two wire staples on the top of the "Explorer," and across the portion cut away for the lever to work in, the grenade is held in position by an india-rubber band. All being ready, the "Explorer" is placed gently in the water in the gully or closet trap, and the free end of the cord secured. The "Explorer" is then washed over the trap by means of a bucket of water (hot water is best), a slight pull or jerk is given to the cord and the clip is pulled off the lever, the spring sends the lever upwards and thus breaks the glass grenade, releasing the chemical. The

FIG. 52.

"Explorer" should be left in the drain or soil pipe until the search for leaks is completed, as, if it is withdrawn, the odour from it, or from some fragment of the glass grenade, may permeate the room.

Note.—I give sketches (Figs. 51 and 52) of explorer and glass grenade.

57 Q.—What is this? (*Note.*—The Examiner here showed the candidate a Smoke Rocket, used for testing drains where a proper machine cannot be obtained for the purpose.)

A.—A smoke rocket for testing drains.

Note.—For the information of students who have never seen one, I may explain that the rocket is a cylindrical case, about seven to ten inches long, and two inches in diameter. One or two strips of wood are attached to the rocket to keep it clear of the drain invert, thus allowing any water which may find its way into the drain a clear way under the rocket.

58 Q.—What is the advantage of egg-shaped sewers?

A.—The velocity of flow is greater when a small volume of sewage is in the sewer than it would be in a sewer of a circular shape of the same sectional area, as the sewage is

deeper and there is less friction against the bottom and sides of the sewer.

59 Q.—What is meant by the hydraulic mean depth?
A.—The hydraulic mean depth is the cross-section of the stream (or sewage) divided by the wetted perimeter.

60 Q.—What is the wetted perimeter?
A.—The portion of the circumference of the pipe (or sewer) wetted with the sewage (or stream).

61 Q.—How do you find the velocity of flow?
A.—It is determined by the fall, the smoothness (or otherwise) of the inside of the pipe (or sewer) and the hydraulic mean depth. A common and much used formula is "Parke's," which is: $V = 55 \times \sqrt{2DF}$, per minute where V = velocity in feet per minute, F = the fall in feet per mile, D = the hydraulic mean depth, in feet.

Note.—This latter is one-fourth the diameter of the pipe when running full or half full.

62 Q.—How do you find the cubic feet discharged per minute?
A.—Multiply the velocity in feet per minute by the sectional area of the sewage (or stream) in feet.

63 Q.—Give the formula for finding the quantity of air that would ascend a flue or shaft per hour?
A.—De Chaumont's is the most convenient; this is as follows:

$200 (\sqrt{h (t^1 - t)} \cdot 002 \text{ P.A}) = \text{D}$, where
h = height of flue or shaft in feet.
t^1 = temperature within shaft.
t = temperature of outer air.
·002 = rate of expansion for each degree Fahr.
P = area of shaft in square inches.
A = factor for friction, generally $\frac{3}{4}$.
D = delivery in cubic feet per hour.

64 Q.—How would you disinfect books, boots, a fur muff, or a sealskin jacket without damaging them?
A.—Expose them freely in a gas-tight box or case to formaldehyde vapour, about one cubic centimetre of formalin to 300 cubic centimetres or less of air. The books should be so suspended that the leaves fall open.

65 Q.—How should a screw-down tap be repaired?

A.—A screw-down tap is an ordinary tap for house service; and the only repair it usually needs is a leather washer being put in. Any other repair would most likely need a plumber and a new tap.

66 Q.—What is an iron tie for bonding hollow, or cavity, walls?

A.—These are made of both wrought and cast iron and even iron wire; they should be twisted or drooped in the middle to prevent moisture being conveyed along them from the outside portion to the inside portion of the wall; they should also be well tarred and sanded or galvanised to prevent rusting. They are either rough or turned down a little at the ends or, sometimes, split and widened out to allow of a grip in the mortar-joint.

Note.—See Fig. 53 for Bonding or Iron Tie.

FIG. 53.

CENTRAL RESERVE

APPENDIX

Examinations are held by The Royal Sanitary Institute in:
Practical Sanitary Science;
Practical Hygiene for School Teachers,
Inspectors of Meat and other Foods; and for
Inspectors of Nuisances.

All the above examinations are held several times in a year, and at different centres in England and Wales; also in Ireland and Scotland.

All particulars as to entrance fees, &c., can be obtained from the Secretary, E. White-Wallis, F.S.S., at the offices of the Royal Sanitary Institute, Parkes Museum, Margaret Street, London, W.

The examination for Sanitary Inspectors (for London) is held by the Sanitary Inspector's Examination Board; for particulars, forms of application, &c., apply to the Hon. Sec. of the Board, 1 Adelaide Buildings, London Bridge, London, E.C.

The Institute of Sanitary Engineers hold an examination in Sanitary Science; for particulars apply to the Secretary, Arthur E. Ashby, I.S.E., 19 Bloomsbury Square, London, W.C.

The Incorporated Sanitary Association of Scotland, hold an examination in Sanitary Science; for particulars apply to George Middleton, M.A., L.L.B., Writer, 83 Bath Street, Glasgow.

The Carpenters' Company hold an examination annually, in London, in Building Construction and Sanitation (or Sanitary Building Construction); for particulars apply to the Secretary, The Worshipful Company of Carpenters, London Wall, London, E.C.

Examinations are also held by the Victoria University, Manchester; University College, Liverpool, &c. &c., in Sanitary Science.

Sanitary Science is also a subject of examination at the Incorporated Association of Municipal and County Engineers and other professional examinations.

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